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Flashes

Picked Up Along Editorial Airways

» IT COSTS REAL MONEY to be regulated, as anyone can find out for himself by wading through the 106 pages of the Independent Offices Appropriation Bill Hearings that have to do with the CAA. It seems that, with becoming modesty, the CAA asked for only $35,000,000 for 1940. Without batting an eye the Budget Bureau scaled that sum down to $21,230,000. A comparison of a few details are interesting:

	Asked by CAA	Passed by Budget Bureau
For salaries and expenses CAA.....	$18,724,920	$13,750,000
For salaries and expenses, Safety Board.....	741,210	380,000
Printing and binding, CAA.....	116,400	100,000
AIR NAVIGATION FACILITIES	15,312,870	7,000,000
	$34,895,400	$21,230,000

The last item is not as bad as it looks, for it seems that the original estimate was based on a three-year program, the revision on one. But, at that, the amount to go into actual airways equipment is only about half the amount to be spent on CAA salaries. Perhaps some day some way might be figured out to reverse that ratio. Can't help but wonder what Mr. Noble had in mind to do with that other $5,000,000 for salaries that he asked for and didn't get. You could hire a lot of people for that!

» MR. NOBLE EXPLAINED to the appropriations committee that he was practically saving the country money, at that. Although he admitted that the old Bureau of Air Commerce and the Air Mail Bureau of the Post Office together had spent only $11,650,000 for fiscal 1938 and some $15,000,000 for fiscal '39, someone had told him that they *might* have asked for $19,640,134 if they had still been in business, and, therefore, that $1½ million ($21,230,000 minus $19,640,000) "represents the estimated additional cost of administering the new duties imposed upon the Authority by the statute." That's the difference as the Budget Bureau saw it. The "cost of administering the new duties," however, based on the amount originally requested, would have been a good round $15,000,000 if the BB hadn't put its foot down.

In This Issue

Few trends of the past ten years have been more significant, or hold more promise for the next ten than the extension of our transport aviation beyond our political boundaries and across the oceans. With trans-Atlantic schedules in the offing for the coming Spring and Summer, we thought it worth while to round up in this issue the story of America's part in world air transport, and to point up some of the problems that will face our operators through the competitive efforts of foreign governments as we prepare to push off across the Atlantic. Obviously, the job could not have been done without the cooperation of Pan American, American Export, and others who have been intimately concerned with the problem. The greatest share of the load of collecting, compiling, arranging and writing this material fell on the ample shoulders of Dan Sayre, Associate Editor of AVIATION. . . . A device designed for the new Curtiss-Wright Model 20 transport to help eliminate "cockpit trouble" is described by T. P. Wright, Director of Engineering for Curtiss-Wright. . . . Engineering and Research Corp. of Washington figures in two stories, one on the development of wood and plastic propellers, the other on Fred Weick's new little airplane with the Morehouse-designed engine. . . . Harlow, Howard and Fairchild figure in other airplane stories. . . . Pratt & Whitney and Hamilton Standard announce a new synchronizer. . . . Don Fink's radio department carries the important story of new ultra-high frequency generators which hold great promise in airway aid applications.

» WE DON'T MIND SPENDING in a handsome way if we are sure that we are getting something for our money. And, mind you, we are not saying that we aren't getting it in the CAA. It is still too early to offer criticism on that score. Behind the facade of bustling secretaries and bursting files there is a tremendous amount of hard work going on, and there are many places where money may be spent profitably in large amounts for the development and the safety of our aviation, both private and commercial. We only want to be certain that the money gets spent in the right way so that when the CAA winds up its "educational" year, come August 22nd, it will be able to report to its 130,000,000 "stockholders" that they are getting a reasonable return on their investment.

» AND SPEAKING OF MONEY, we hope that the needs of the Weather Bureau for adequate funds for aerology are not being overlooked. The

(*Turn to page 13*)

DEWEY ELDRED'S recent international non-stop record for light seaplanes is a fitting tribute to that lightweight champion of the air—the Lycoming 50 HP Engine. The Lycoming-powered Lubri-Zol's Taylorcraft covered a distance of 858 non-stop miles—from New York to Daytona, Fla.—at an average hourly speed of 71.1 miles. Dewey Eldred states that he made the flight at an operating cost under $15.

The smooth performance of this 50 horsepower engine, whether during record flights or every-day flying, makes it the star of the skyways for light aircraft. The Lycoming 50 HP engine is fast becoming the favorite of pilots of such ships as Aeronca, Cub, and Taylorcraft. Ask a Dealer of any of these popular planes for a Lycoming demonstration. Fly behind a Lycoming and *feel* the difference!

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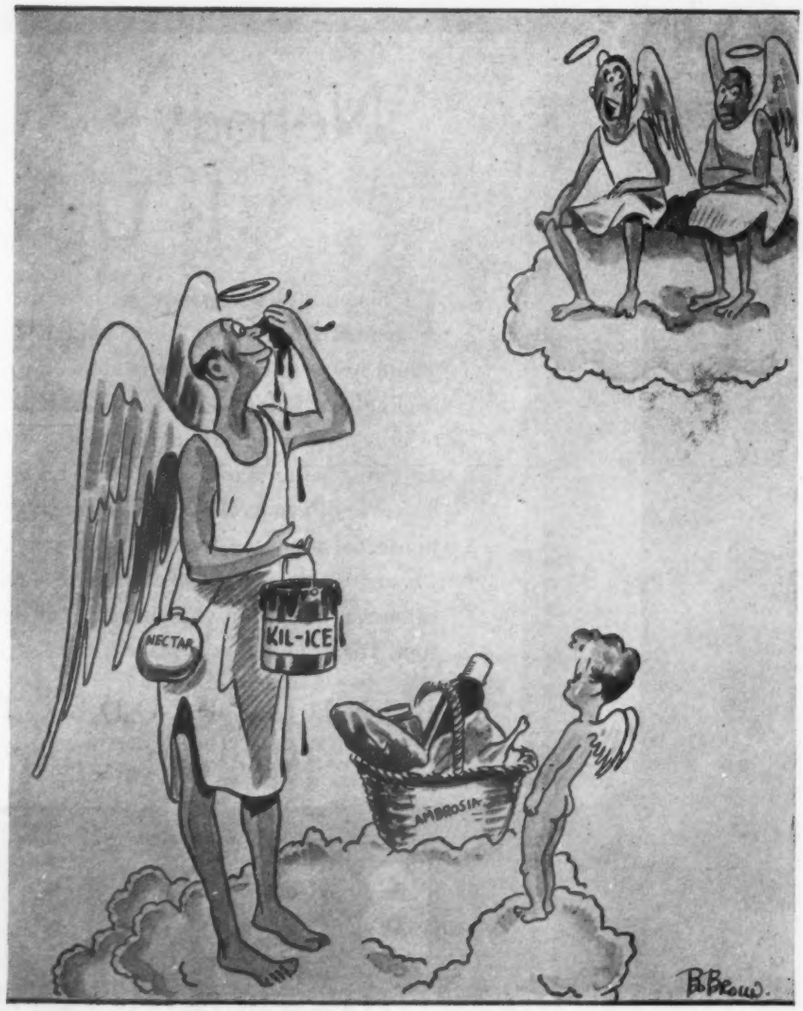
allowance for 1939 was approximately $2.5 million, and to bring the service in line with national defense and other aviation needs an estimated $3.0 million increase would be required, bringing the total for 1940 up to $5.5 million. We understand that some of the anti-aviation, pro-agricultural members of Congress have set up a squawk, claiming that the poor farmers are getting gyped in the deal. Perhaps the real trouble lies in the use of the word "aerology". They can't see how such high-falutin words have got anything in them for the dirt farmer who perhaps has never seen an airplane, much less ride in one of the durn things. But someone should explain to the farmer groups that never before has so much been known about the weather and its vagaries, simply because aviation needs to know, and that money spent for "aerology" will beyond doubt benefit the farmer as much, in the long run, as it will benefit the aviation groups. There is no reason why every airport in the country should not become a center from which accurate weather information for all farmers in the district can be disseminated,—and what they can get there will be a durn sight better than anything they can get out of the Farmer's Almanac!

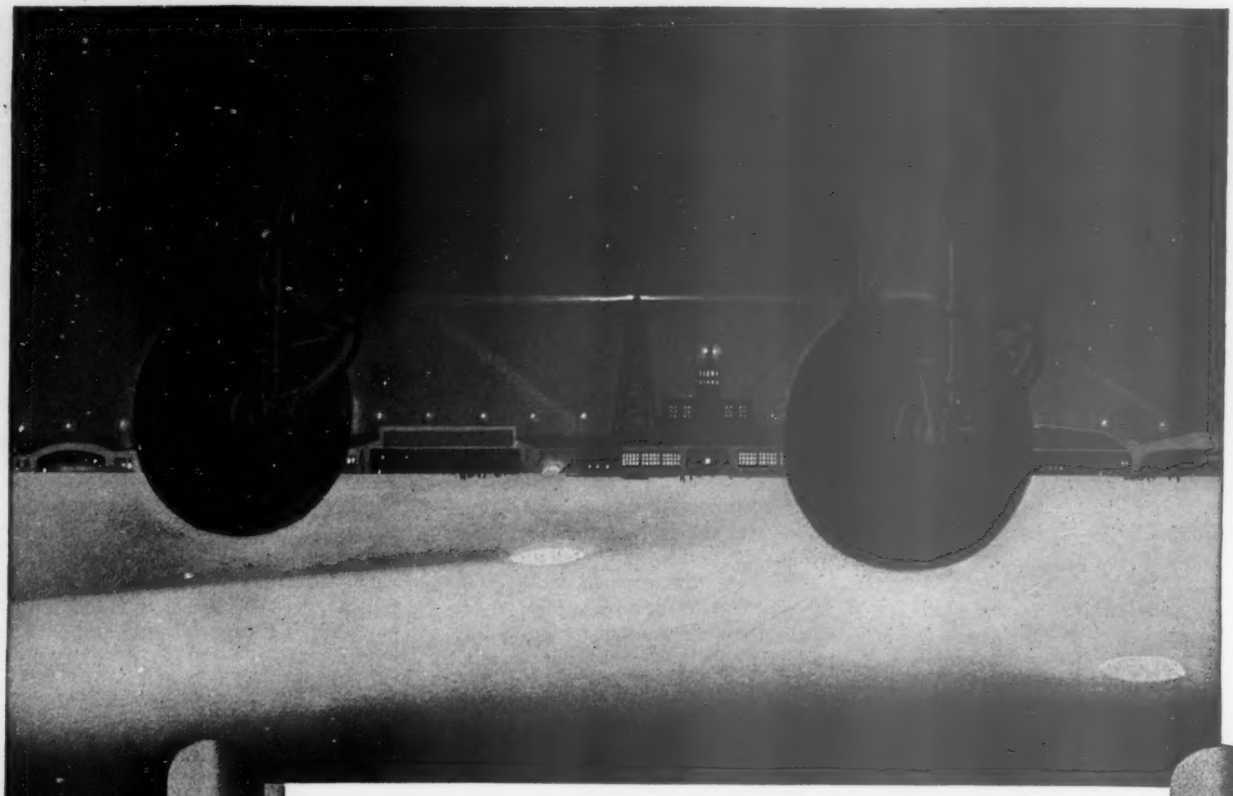
» IMPORTANT MEETINGS marked the month since we last went to press. Maintenance matters, theoretical and scientific aeronautics, and national defense were the themes. Fowler W. Barker got together the largest collection yet of airline maintenance men and manufacturers for a three-day session in New York's Hotel Lexington. Followed immediately Major Lester Gardner's technical meetings at Columbia, winding up with the Honors Night dinner mentioned elsewhere, and, as we go into the hands of the printer, the first National Aviation Forum gets under way in Washington. Gill Robb Wilson and his associates are to be congratulated for their untiring efforts to organize this significant meeting at this time.

» BRITONS PROTESTED, and not without reason, to the "morale" ratings given them in our "Box Score" (AVIATION, January, 1939). They stoutly maintained that the fighting pilots of the RAF are the finest in the world, equalled only in "élan" by the devil-may-care French, with the more stolid Germans and the temperamental Italians running a poor second and third. The trouble, of course, came about from my failure to provide an adequate definition of the word "morale" as used in my article. There was no intention to attempt to rate the relative quality of the fighting pilots or of the staff work of the organized air forces in any of the countries involved. Although there undoubtedly are differences, the safest procedure under the circumstances was to rate them all on an equal basis on such points. The controlling element in the scoring in the "morale" column was industrial rather than tactical morale. The ratings were intended to show the relative likelihood of a breakdown in the aircraft production industries due to strikes, sit-downs, lock-outs or other industrial or social upheavals. Assuming no complete economic or social breakdowns under war-time pressures, the totalitarian states must be rated high, the democracies low, in such morale. Our apologies to the British, not for underrating their morale, but for our failure to explain just what we had in mind.

» TWO ACCIDENTS to military aircraft recently had unexpected and far-reaching results. If a certain test pilot hadn't made a slight error in judgment while performing a routine flight, negotiations with a certain foreign government for the sale of certain U. S. aircraft might still be moving along well oiled diplomatic channels. But that unfortunate crash is still echoing through Congressional halls, and the whole of our foreign relations policy, for better or for worse, is going through the wringer. Then, too, if an engine hadn't cut out as Ben Kelsey was about to land an experimental ship after a near-record trans-continental flight, the public might not have known (at least until after evaluation boards had done their work) that our Air Corps is about to have delivered up to it for examination a group of the fastest and most powerful fighting airplanes in the world.



"Maguire's hopping off for London, and doesn't want ice forming on his beezer."



"Nobody's Sweetheart Is Ugly"

IT'S simply human nature for all of us to look upon our own work and think well of it. But how often collaboration and cooperation would result in modifications much for the better! In the design of landing-gear for any aircraft, the ready help that Bendix stands eager to provide is frequently a very real contribution to the new plane's satisfying performance. For we cannot pick airplane wheels and brakes nor Pneudraulic Shock Struts off a shelf and supply them, ready to use, for any plane. We need to know certain vital facts and factors . . . and so do you, who design the aircraft. Hence, our repeated, earnest, urging upon your attention of this matter of early collaboration. It makes better airplanes!

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Side Slips

By
ROBERT OSBORN

» COMMENTING on the new extensive program for training young pilots, administration officials said that probably it would not be possible to include women in the flight training, but that they could be trained as airplane mechanics.

We are wondering if military pilots of the future are going to approve of having important parts of their airplanes stuck together with hair pins.

» EXPERTS testifying before the congressional monopoly investigation committee predicted that military planes of the near future will have wings, fuselage, and many other parts made out of sheets of plywood and plastic materials pressed into molds under heat.

In about two weeks the authors of the Sunday Supplement blood-curdling

articles will have foreign spies developing a species of termite able to work under high temperatures and pressures.

» THE NEWSPAPERS prominently featured stories about a young test pilot who had dived a new pursuit plane to a speed of 575 miles per hour, and the next day carried another story that his engagement to a very nice young lady had been announced.

This particular pilot is the same one we reported, who, come Spring one year, turned in his flight test reports in poetry with notes on the beautiful flowers in bloom (tra-la) along the speed course.

» ANY MILITARY PILOT who has had to face a hard-boiled crash board will enjoy the statement of a young civilian pilot reported in the local papers. "I would have made a perfect landing, I think, had it not been for a little tree in the space I picked to land. It caused the damage to the plane."

» WE CERTAINLY DO get discouraged in reading the newspaper articles by a certain syndicated writer telling how much inferior American planes and engines are when compared to those of other nations. It is too bad that this condition exists at this time of international crises,—if only we had some good designs in production it might be possible to sell some orders for them abroad.

» IT IS VERY DIFFICULT at times for a non-philatelist to understand the reasoning of stamp collectors in placing the highest values on the most imperfect stamps. From a recent article on this subject we learn that the most valuable air mail stamp is an early one on which the picture of an airplane was printed upside down, and the latest one to excite the interest of the collectors is the current 6 cent red and blue air mail stamp, one sheet of which had the horizontal perforations omitted.

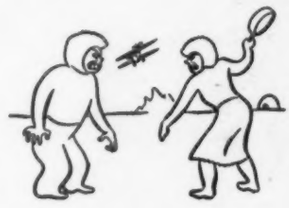
If there are any collectors with similar ideas in the airplane business we know where they can find a Jenny without any wings, and a seaplane with a tractor propeller mounted on a pusher engine nacelle.

» "UNITED AIR LINES HAS COMPLETED ITS 25,000TH COAST-TO-COAST FLIGHT APPROXIMATING 66,000,000 MILES".—News Bureau Ticker item reported by W. F. D. of Port Washington, N. Y., who asks if this represents a new distance record, or if a number of passes at the field were necessary to get the ship down?

» IN BETWEEN PUFFS on one of our cigars the other day the Intrepid Aviator remarked that he saw in the papers that some European scientists were getting very much interested in flying machines where the pilot does all the work, and had even formed an association called the Human Muscular Flight Institute. He said he is going to follow the activities of that Institute very closely, to make sure that he does not, unwittingly, sign up for any of that kind of flying.

» WE SEE IN THE NEWS that hearings of Eskimo divorce cases in Alaska are being speeded up by means of a "flying court",—a judge, marshal and clerk who travel around to isolated outposts by airplane.

Who remembers the quaint old days of not so long ago, when people used

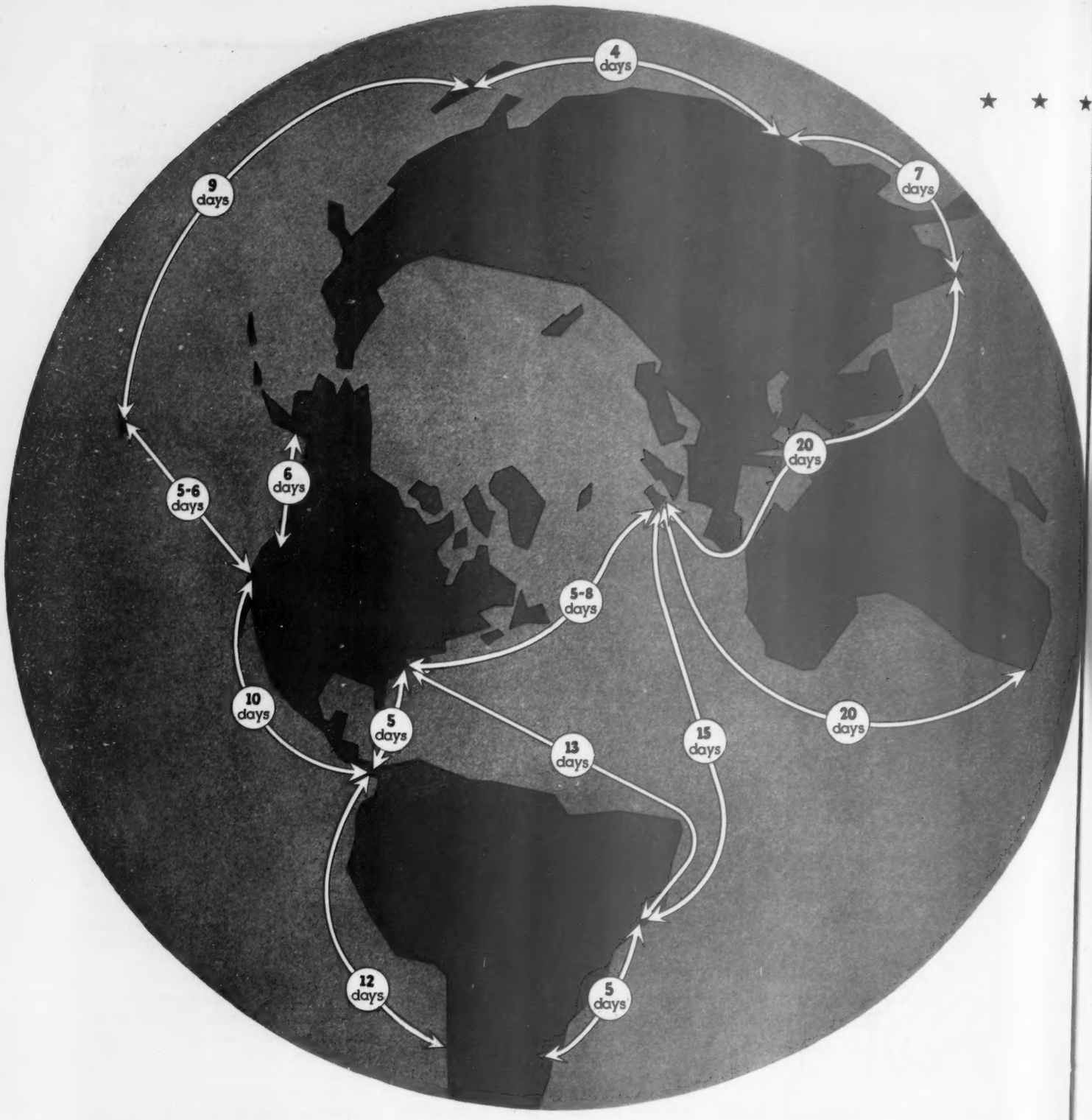


to consider the airplane as an effective instrument for promoting amity and good will between nations and people.

» WE'D LIKE TO SUGGEST that a fortune awaits the manufacturer who first incorporates a suitable rail in an air line passenger transport. The newspapers and news reels are always featuring pictures of actresses perched on the rails of trans-Atlantic liners, displaying shapely legs, and the first air line to operate the new super rail passenger transports would undoubtedly monopolize all of the stage and screen business.

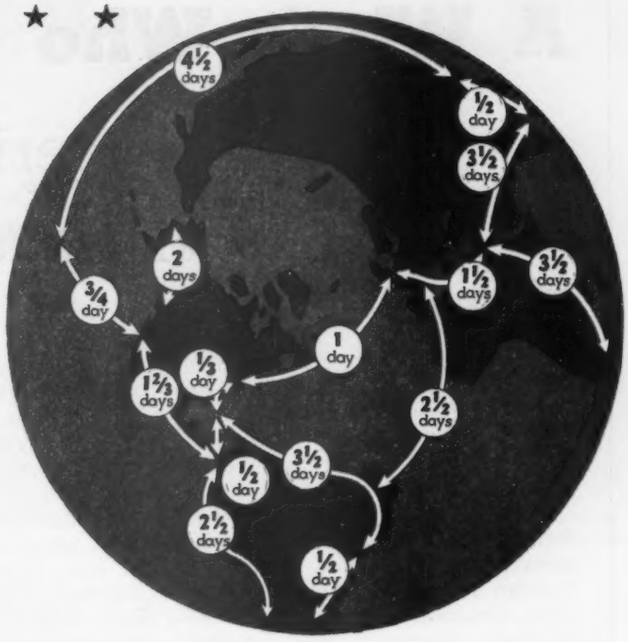
» "AIRCRAFTS UP AFTER SHARP DIP"—*Stock Market Headline.*

If Mr. Sperry could work up an automatic financial pilot for some of these companies we might have a little smoother riding in this rough Wall Street air.



IN 1929: The pace of the world's trade routes, geared to the speed of the ocean steamer, was slow indeed. Mail took two weeks, six weeks, eight weeks to bring an answer to a query. A business trip to another continent consumed a month, perhaps a season.

AVIATION *for March, 1939* ★ ★



IN 1939: **The world of trade, now scaled to the swift flight of the transport plane, has shrunk to a sixth of its former size. By the year's end the American business man will be able to reach any city in Europe, Latin America, or Alaska within the time he could cross the United States by train. Asia is now less than a week away; New Zealand and Australia soon will be no more distant.**

THIS EVER-SHRINKING WORLD

TEN YEARS AGO LAST MONTH, our air line industry reached South America with the first of the long international airways which were to give us an air transport pre-eminence on that continent. Five years ago this month, test pilots took aloft the first of those ocean-flying Clipper ships which were to carry the flag of American commerce to the gateways of China. Today our American flight captains, driving new Clippers of doubled size through final proving flights, hold almost in their grasp a leadership on the north Atlantic that Americans have not had since the days of sail.

It makes a high-stepping story—this first decade of American battling for a place on the sky-ways of the world. There is everything here that one looks for in a traditional American success: There is bold planning. There is courageous experiment in untried fields of finance and industry. There is superb organization. There is breath-taking speed of accomplishment. There are trackless jungles, unscaled mountains, and desert islands made to yield sites for efficient airbases. There are laboratories and factories and test fields harnessed to lick problems half a world away. There is enough brilliant pioneering in aerial pilotage, maintenance, radio and navigation to fill half a dozen text books. If AVIATION should miss this thrice-significant opportunity to recount the highlights of this decade it would be guilty of gross editorial negligence.

But it is not the past ten years of America's role in international air transport that really concerns us in this issue; it is the next ten. The important question which faces the industry—and the nation—is: Where will we stand on the world's air trade routes in 1944; in 1949? Out in front, where we stand today? Possibly—but not unless we are willing to fight for that aerial leadership as Americans have rarely fought for national interests beyond our continental borders.

For ten years the Americanism of our efforts in this field has been the greatest of assets. So long as competitors kept their financial aid to their government-directed air trusts within reason, the American system of assistance only through mail contracts was adequate and infinitely preferable to the European pattern of outright subsidy, as the results well show. But international air transport, like everything else affecting the international ambitions of nations, is changing profoundly. Air lines, once considered merely a means to expedite commercial exchange, have become arteries of prime significance in international trade and politics. A nation convinced it must "export or die" does not pause at the cost of doubling or redoubling its expenditures on so direct a method of export stimulation as its international air lines.

As a result: Where our international routes have had until now only limited competition from the lines of two European nations in Latin-America, it will be challenged by four foreign competitors before the end of 1939. Where but one European nation has hitherto advanced its services all the way to China, five nations now have plans for direct routes to that market. On the North Atlantic no less than four nations are already clamoring to share, with us, this blue ribbon trade route of the world.

Steps which America might take to meet this foreign challenge have been indicated in succeeding articles. It may well be that we must at least partially modify our traditional American Way. But whatever we do, or whatever course we take, must be based upon as complete an understanding of each situation as it is possible to secure. If the following articles—prepared by Daniel Sayre, Associate Editor of AVIATION—can help to form such proper understanding, we shall feel more than amply repaid for our efforts.

A Who's Who of World Airlines

I. Pan American PAA Airways

THE COMPANY which was soon to take the name of Pan American Airways Corporation was formed Oct. 3, 1927 to pool the international air line projects of three slightly older corporations.

Each of these organizations had formulated plans and taken some steps toward organizing an air line between Florida and Cuba. Between them, fortunately, they could assemble the basic elements required for such an enterprise. They held U.S. and Cuban mail contracts for the route and had gathered the nucleus of the needed planes, equipment and operating personnel. They held financial resources and connections vital to the project. The U.S. mail contract called for a first flight by Oct. 19. The infant company was hardly born then, when it was faced with the first of those Herculean tasks of airway building which have been such a feature of its history. A first flight was dispatched on Oct. 19 and the contract was saved. By Oct. 28 scheduled service was in full operation.

Thus was a tradition launched which is still characteristic of Pan American projects—"It can be done!" And the factor which perhaps did most to make this Gulf Stream triumph still exists in Pan American's set-up. Each of the three companies in the merger had been led by young men. They shared young Trippe's intense conviction of the potentialities of international air transport as a field for the investment of private capital. Many of them personally had access to substantial financial resources. Ten out of eleven of them were War-trained pilots in their own right with a highly realistic concept of the task they were undertaking. As these men became the directors and executives of the swiftly growing enterprise, this knowledge of theirs paid dividends beyond price in speed of decision, intelligence of direction and general cooperation between men in the office and men in the field. As the air line grew and needed new sums of capital, these young men found it among their own kind, among other financial groups in the aeronautical industry, or among industrialists and financiers, who, if not flyers, were men with active interests in our commercial relations with the countries which the air line came to serve.

The story of the infant's swift growth is told at some length in subsequent articles. Today its airline network covers every country in Latin

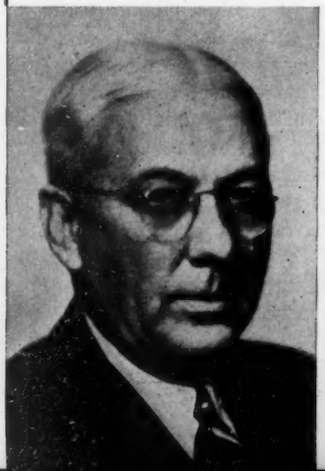
(*Turn to page 50*)

JUAN TERRY TRIPPE
President and General Manager

A Record of Swift Progress

Year	Miles of Route	Passengers Carried	Passenger-Miles	Mail & Express Poundage	Number Employees
1928	251	9,500	297,000	270,155	118
1929	12,265	20,728	5,360,000	485,140	987
1930	17,861	39,508	8,980,000	731,187	1,593
1931	20,664	46,079	12,479,000	819,657	1,667
1932	26,652	63,600	19,571,000	1,279,130	1,918
1933	30,982	80,636	27,511,000	1,562,361	2,292
1934	32,552	112,354	35,000,000	1,884,000	2,801
1935	40,006	142,630	56,611,000	2,092,644	3,176
1936	40,567	168,000	65,000,000	3,006,000	4,055
1937	50,695	214,000	90,000,000	4,000,000	4,700
1938	54,500	225,000	90,000,000	4,500,000	5,000

EVAN E. YOUNG
Vice-President



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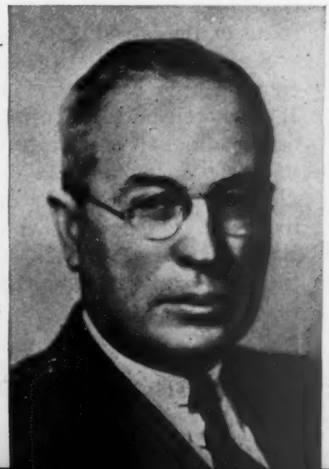
Vice-President



GEORGE L. RIHL
Vice-President

ROBERT G. THACH
Vice-President, General Attorney

A Sikorsky S-42 swings in over Rio.

—have been a big factor in building trade and goodwill among the Republics of the Americas. But Europe, in a reckless drive for export trade, counts on aircraft to move these world markets into its own neighborhood. Uncle Sam must roll up his sleeves or lose a hard-won leadership in Latin-American skies.

THE AIR TRANSPORT INDUSTRY of Latin America is surprisingly vast in extent. Some 47 corporately separate companies offer no less than 203 regular, scheduled services over routes which total 88,146 miles in length, more than twice the length of all the air lines in the United States. Air transport plays a far more important role in Latin America than in most other parts of the world. On route after important route, the airplane is not merely one of several modern means of travel, it is the only one. It is astoundingly international—the 47 companies operate under nineteen different flags. Many of them operate across the territory of at least two countries. Several cross a half dozen countries or more. Mere geography forces a widely divergent pattern upon the air line development of a dozen different regions. There are tropical jungles and snow-piled mountains, low, open seacoasts and narrow shelf-like ones, long trans-oceanic passages, great river valleys, broad plains—and every conceivable kind of climate and weather.

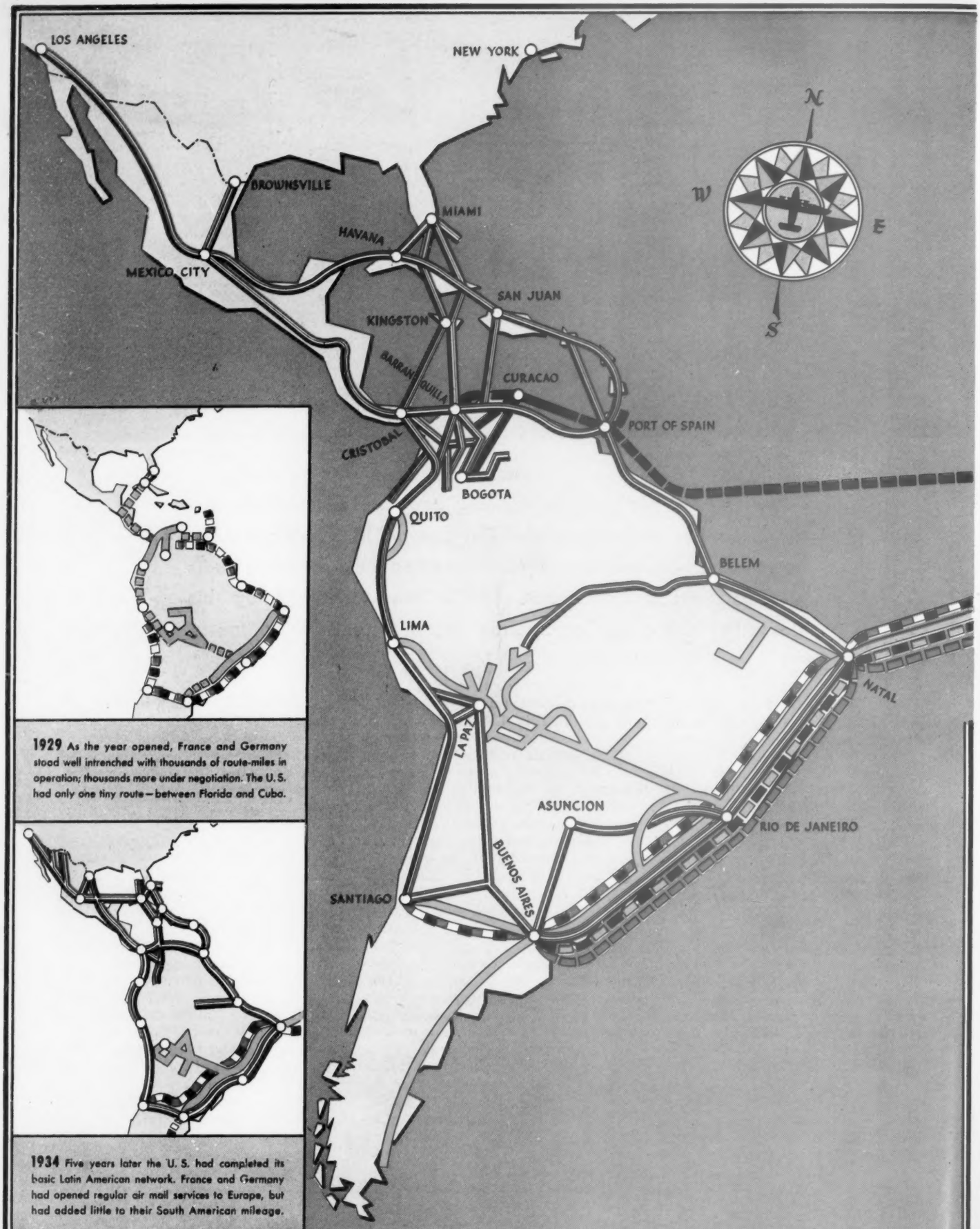
Our own Pan American Airways, with its affiliated companies, operates approximately half of this vast network. It is therefore one of the most important transport companies of any kind in Latin America. It crosses the territory of all twenty of the separate republics and a large number of the European dependencies south of our border. It operates in every one of the varied geographical districts save the extreme southern tip of South America. From all this you can get some idea of the great importance of the part which this country plays in the picture. How we came to play this part and why we must continue to play it, is a tale well worth the telling—

The importance of Latin American countries to the U. S. is obvious. South of our borders they form a huge area rich in raw materials, agricultural products and minerals—many of which are indispensible to our needs. Practically without manufacturing industries of its own, this area, in return, needs great quantities of our manufactured products. During the first years after the World War the annual flow of commerce in each direction between the United States and Latin America exceeded a billion dollars a year. Over the past twenty years—despite the inroads of a world-wide depression our average annual exports to Latin America have been in excess of $600,000,000. And in the judgment of most economists, Latin America has not so far even approached the prosperity to which its resources entitle it.

Unfortunately, the United States is not the only country ambitious to supply Latin American needs. For decades before the War, the nations of Europe had used all their capital resources, diplomacy, and commercial skill to establish their interests in this market. As the war ended, they turned to it once more with a grim intention of winning back that large share of the trade which had slipped to the United States.

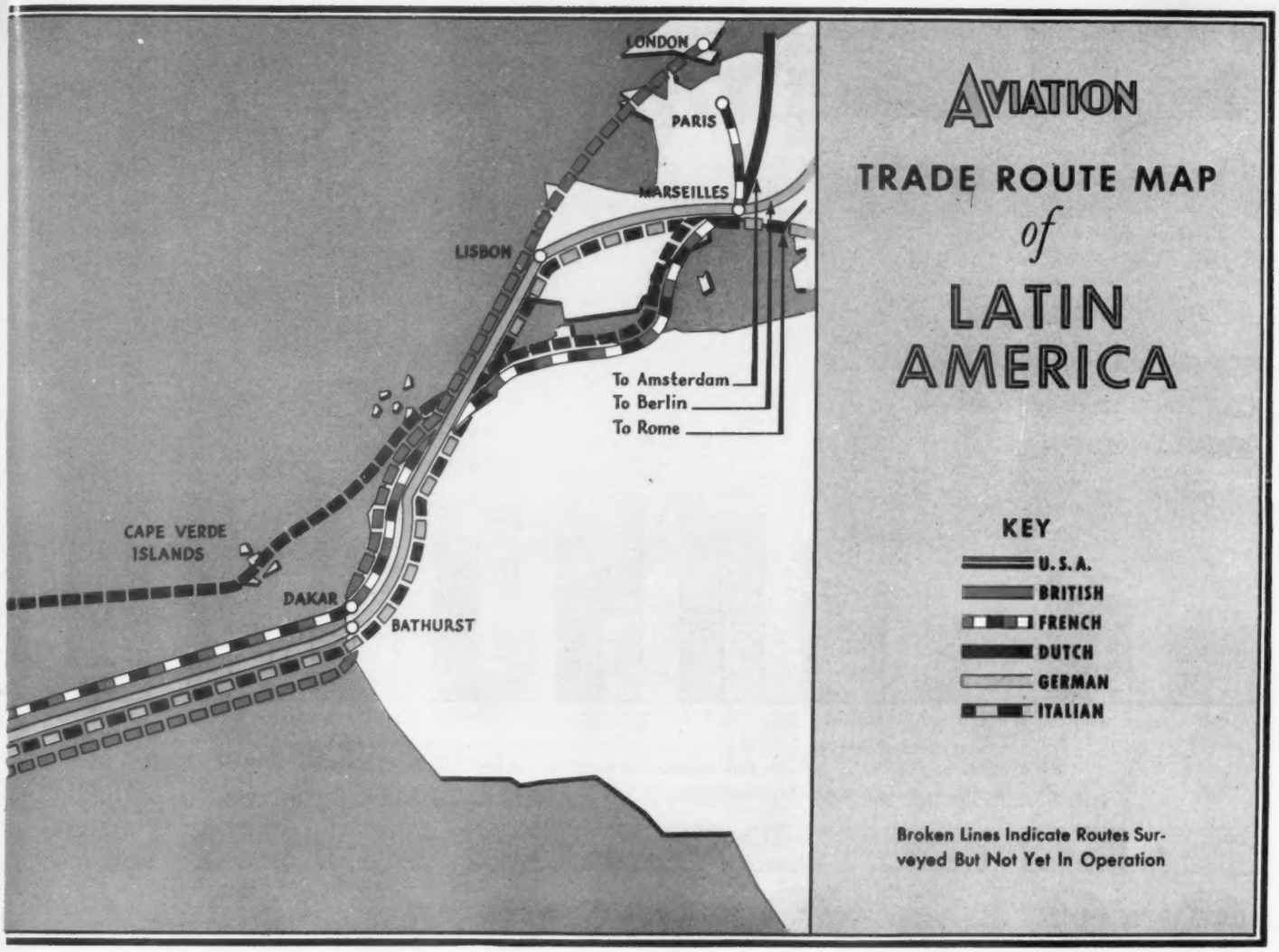
Geographically, of course, we held a great advantage. With the important exception of the rich countries along the East Coast of South America (which are about equidistant from European ports and New York), most of Latin America lies much closer to us than to Europe. All things being equal, that meant easier access to the market for American salesmen and samples, lower shipping costs, faster service on repairs and parts.

This country might well have undertaken to strengthen that advantage by backing up its shipping lines with air transport projects within a few years after the Armistice. Latin



1929 As the year opened, France and Germany stood well intrenched with thousands of route-miles in operation; thousands more under negotiation. The U. S. had only one tiny route—between Florida and Cuba.

1934 Five years later the U. S. had completed its basic Latin American network. France and Germany had opened regular air mail services to Europe, but had added little to their South American mileage.



In 1939 the air line map shows U. S. routes reaching every important Latin American city. But Germany, through aggressive development of affiliated companies, approaches complete coverage. This year: Germany will add a passenger service to its trans-Atlantic mail run; France will do likewise; Italy and Great Britain will open brand new air routes to B. A.

America was crying for air transport to solve many of its domestic transport problems. The capitals of several countries had no modern connections with their seaports. Many more had no practical transport to large parts of their in-lying territories. Almost without exception each country relied for its intercourse with other nations upon coastwise steamers. Had we gone into these countries, even with crude post-war equipment we could have once and for all established ourselves as the only logical source for Latin American purchases; won ourselves terrific prestige; embarked then and there upon the era of good neighborliness.

But somehow the vision was not in us. Perhaps we were too much absorbed in the big tasks connected with our domestic air transport development. In any case, it was not the United States but Europe which saw the chance and grasped it.

Actually Europe never has had any concept of air transportation save as something primarily international in import. For one thing, its own countries are so small that an airplane flight has either to become international or come to a dead end at the national frontier after an hour or two of flying. For another, each country relies tremendously on colonies, allies or market areas within its sphere of influence for the provision of many indispensible supplies and the absorption of large excesses of manufactured output. To Europe even the earliest of transport airplanes seemed a heaven-sent new means of cementing ties with such areas. Before air lines in this country were carrying the mail continuously across the continent, Germany had established air routes for passengers, mail and express throughout Central and Eastern Europe, France had air lines to Northern and Western Africa and to Istamboul. Britain was planning airways to all parts of its far flung empire.

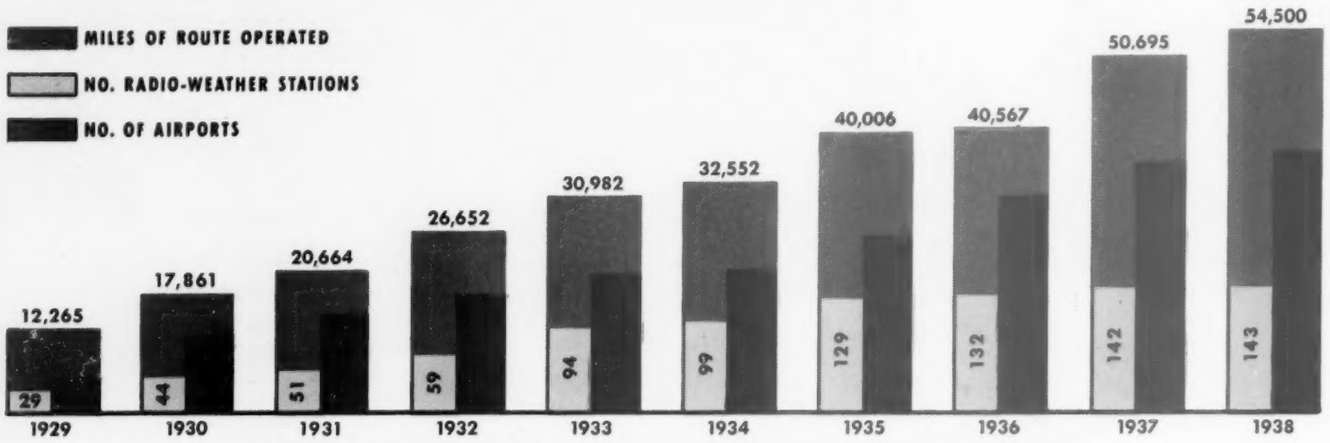
And—by 1928, the year lines in the U.S. were just beginning to carry passengers, German air line interests had been eight years established in Colombia; three years established in Bolivia; two years set up in Brazil. In 1927 France, not to be outdone, had secured operating rights in Brazil and by the next year was running lines southward to Buenos Aires. To top it all off, in 1928 France set up a connecting link between its West African and South American air lines by using fast dispatch boats to carry mails across the intervening South Atlantic from Dakar to Natal. Thus, before the U.S. had set up a single mile of air line south of Cuba, France had swung the East Coast of South America northeastward on the World's postal map until it was less than half as far from Europe as from the

(Turn to page 44)

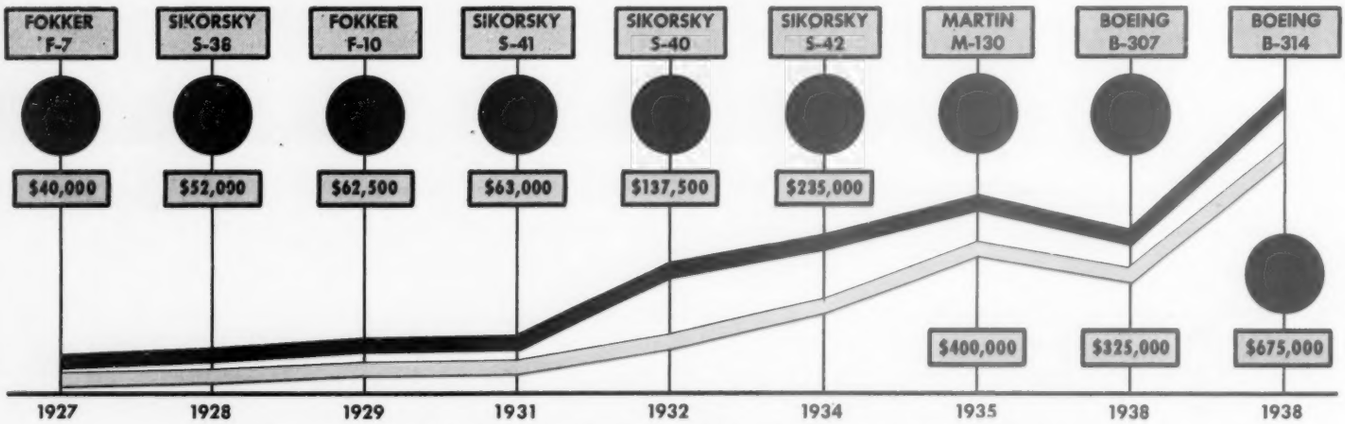
International Flying Comes High

IT COSTS A LOT MORE to operate a transport plane in international service than in domestic. Allowances for foreign duty and the cost of shipping fuel, equipment and materials cause a big differential. More important are basic differences between the two operations: (1) Domestic airways are built and maintained by the U.S. government; Pan American must build and operate its own. (2) Pan American's unique need for ocean-going planes makes its outlay for equipment exceptionally heavy. (3) To operate the two round trips per week allowed by its average U.S. mail contract, Pan American must maintain facilities and ground personnel adequate for at least daily service.

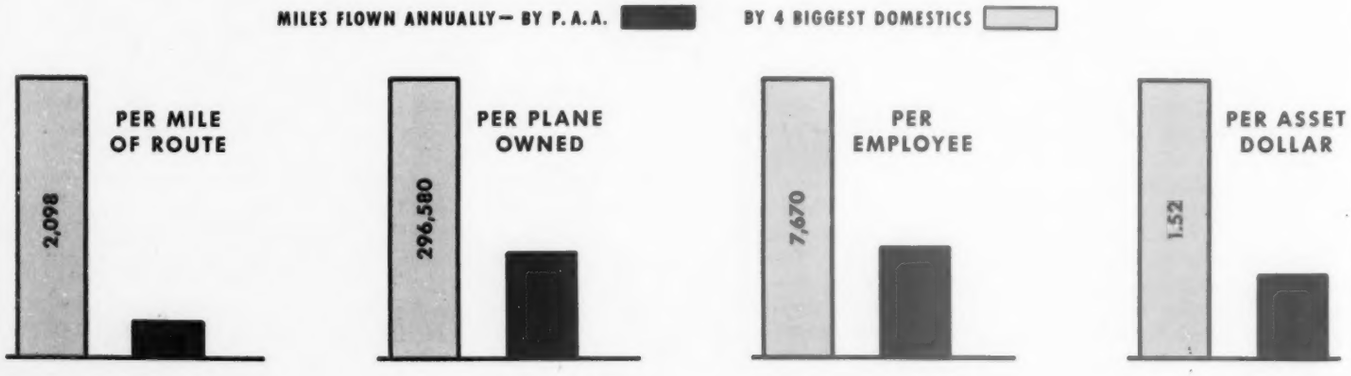
All these factors add heavily to the costs of each mile actually flown.



1. In ten years Pan American has built and paid for the world's longest international air line network—half again as long as all U.S. domestic lines together. Its terminals are elaborate, its intermediate ports fully adequate. Its radio and weather guards are excellent.



2. The development of American landplane transports has been sponsored by a dozen different operators. America's flying boat transports have stepped ahead almost entirely in response to Pan American requirements. Competing international air transport companies get generous grants from their governments to meet this big cost.



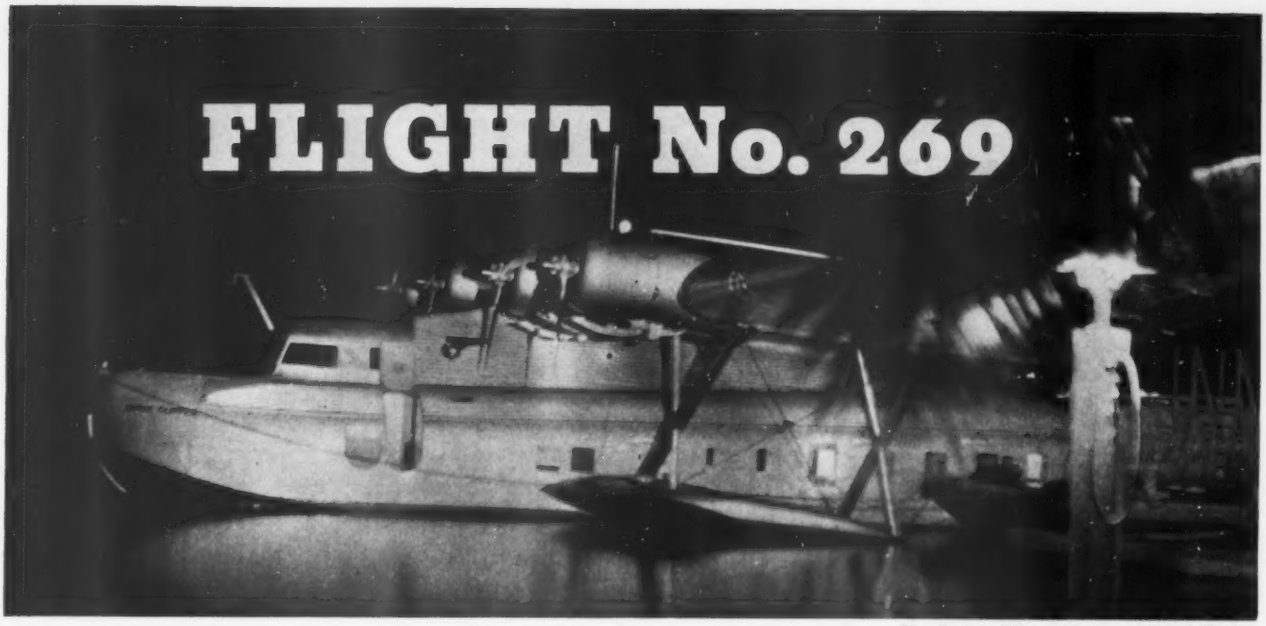
3. Domestic traffic density permits eight times the average international frequency of service.

As a result, domestic operators can get almost three times the annual use from their planes.

And need only a third as many employees to carry out a given amount of flying.

An international plant cost three times as much as a domestic one of the same tranport output.

FLIGHT No. 269



The China Clipper berths at Pearl Harbor.

The delivery of new Boeing-built Clippers promises great steps forward for Pan American Airway's spectacular trans-Pacific air line. But the future of this project is not certain unless the country behind it comes to appreciate its value and insures its continued development through adequate support. Meanwhile it has furnished us with a magnificent background for trans-Atlantic operations.

A BIG NEW BOEING-BUILT CLIPPER moves off from the float of the Pan American Air Base on Treasure Island. Five minutes later it is roaring across San Francisco Bay, lifting, swinging westward. Back in his office, the Air Port Manager writes conscientiously in his register: "Transpacific Flight No. 269, departed Honolulu on schedule. Captain: William A. Cluthe. First officer: . . ." For all his care, he is scarcely five minutes at his writing.

Yet if he enlarged his "remarks" to include this flight's significance and properly traced that significance back into its origins in international air transport history, he might well be writing yet.

For this flight is the maiden voyage of the first of the new big Boeing-built Clippers to try its wings upon an ocean airway. And as such it promises many things to Pacific transport flying.

It promises an end of patching up a service with too few airplanes; an end of turning away passengers and cargo because planes can take but a ton or two of payload and still carry ample crews and fuel and emergency gear; an end of two-mile-a-minute cruising to make fuel last—an end, in short, of three long years of rugged pioneering upon the world's longest ocean airway.

From it should date a fresh new era of mounting traffic; new standards of schedule completion; new heights of service to U. S. trade; new U. S. prestige in Asia and the Pacific islands. It should make practical the completion of the long-projected service from California to New Zealand. Finally it may well justify a fundamental change in our basic American approach to the support of our international air transport enterprises.

Just how can the mere start of one new plane in service stand thus for all these things? Let *us* turn back to a brief discussion of first principles and a brief sketch of the background of this Pacific project.

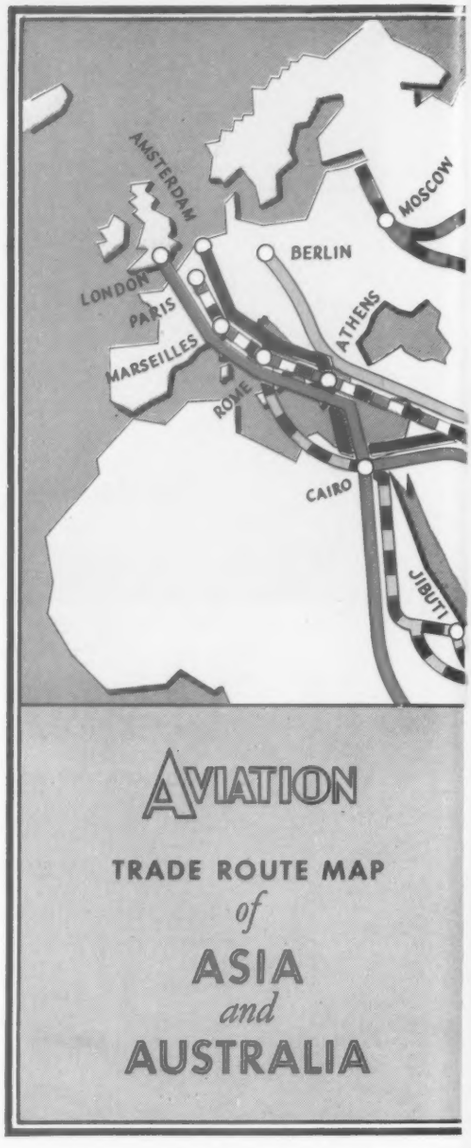
Outwardly, Pan American's trans-Pacific air way is one of the simplest in the world. Its schedules and rates could be written on the back of a post card. For three years it has used but one type of plane. Its operating terrain is uniformly open ocean. One mail contract covers its entire length. One flag flies over all its bases from California to Guam.

But, at that, it has the complex characteristics which makes any part of the international air transport industry simultaneously: (1) an implement for the promotion of international trade and policy; (2) an air transport operation differing only in detail from any other air line; (3) an industry committed to the same aim of ultimately earning a fair return on its invested capital that is held by any other business. The significance of the new ships to this enterprise will be simpler to understand if we approach it from each of these three points-of-view, in turn.

Internationally, the importance of a trans-Pacific airline to the United States, developed along exactly the same pattern of events that made our Latin American network necessary. In Asia, Australia and New Zealand the United States had surged ahead in the war time era until its trade with that area became, in fact, almost twice as valuable as our big trade with Latin America. Post-war Europe had pressing need for a return of its former share. In the late nineteen-twenties Great Britain, France and Holland had progressed far enough in air line technique to start survey

CLARENCE M. YOUNG
Manager Pacific Division

JOHN R. LESLIE
Division Operations Manager



The war in China has upset air line

flights to their Asiatic possessions. By 1930, the Netherlands had reached the Netherlands East Indies with a regular semi-weekly service from Amsterdam. Air France opened a Marseilles-Saigon service in 1931. Imperial Airways extended its routes to Singapore in 1933. Even the comparatively slow planes of the period put Southern Asia within a week's journey of Western Europe. And all three of these nations started busily to work on plans to extend their services into China. Great Britain marched forward with plans to link up with Australia and New Zealand. And by steamer the United States was three weeks away from China and just as distant Australia.

By this time, however, the U. S. already held one prime asset in the form of a partnership between Pan American Airways (45 per cent interest) and the Chinese National Government for the operation of a system of trunkline air routes in that country. That insured our interests on the Asiatic continent to a certain extent. But it did nothing to bring the Asiatic market closer to this country.

Once more, in answer to a mounting clamor from American industry (this time backed by the full encouragement of the government) Pan American undertook to answer the European threat. This time, fortunately, the question of operating priveleges was no vital one. Hawaii and the Philippines offered two ideal stepping stones to break the long 9,000 mile journey. Three other American island possessions, Midway, Wake and Guam—long considered almost commercially worthless—completed the list of necessary stop-over bases. Permission to land at Portugese Macoa guaranteed a terminal on the China coast.

Again, Pan American launched upon a swift program of airway building. By the end of 1935 its big Martin-built Clippers were flying to Manila and back with mail. Twelve months later they were driving through to the China coast with passengers, mail, and express. Plans moved forward for an additional service to New Zealand.

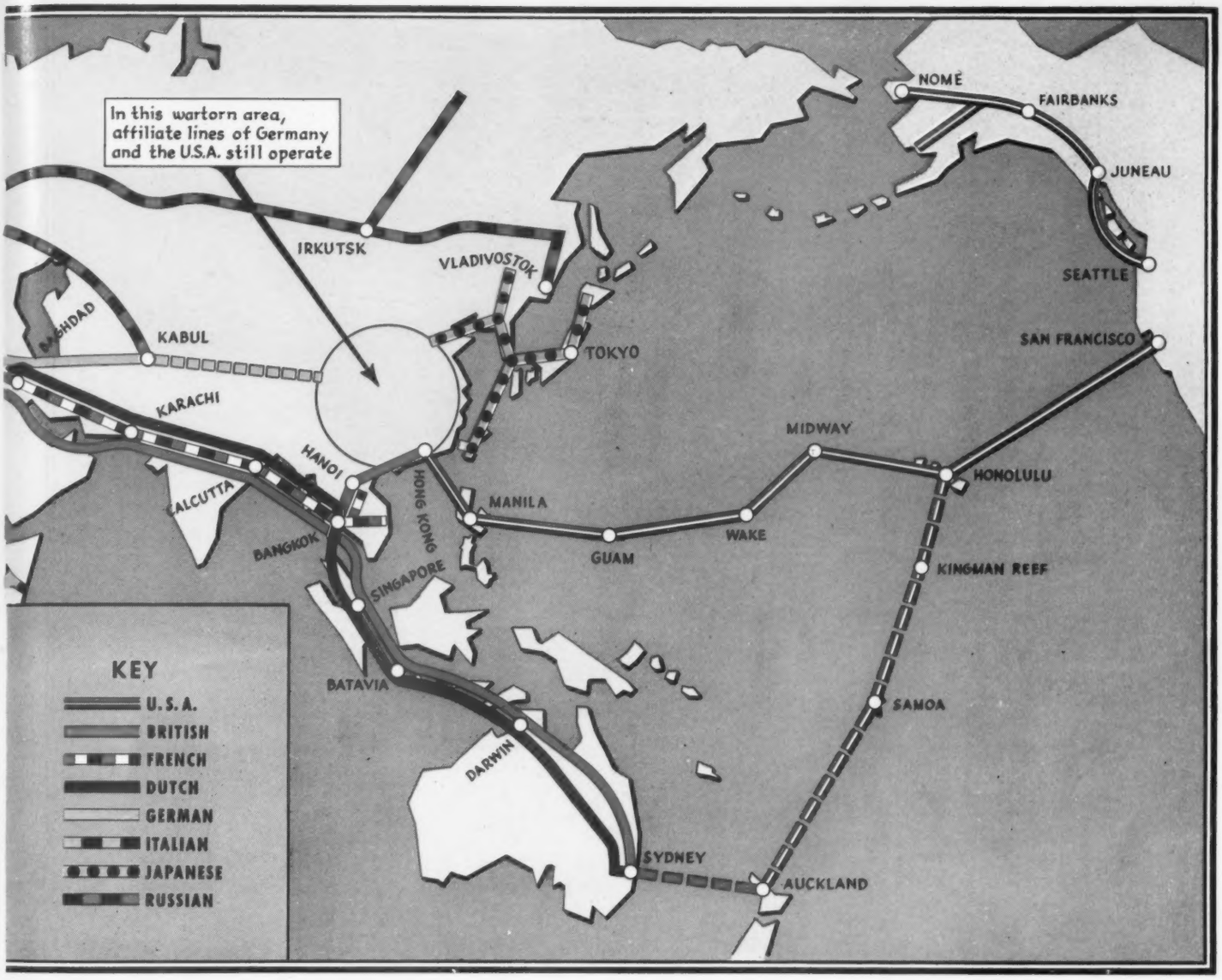
The prime effect was to swing China to within six days of California (against an eight day flying schedule to London). American industry began reshaping its whole concept of business dealings with the Asiatic market. American prestige in the Orient took on a new luster. Of equal significance, the relations between the American mainland and Hawaii, Guam and the Philippines took great strides forward toward new feelings of unity.

Then devastating warfare broke out in China, shifting routes, upsetting schedules on the air lines within that country. An accident destroyed one of the three Clippers carrying the burden of the service. Another accident cut short the projected air line to New Zealand on its inaugural flight. The whole project, for sheer lack of equipment, slipped far down the scale as an international asset. With only two Clippers, schedules became problematical. Departures could not be announced much in advance. Travelers and shippers turned back to their former habits.

Now this Boeing and its sister ships can change all that. Schedules, restored, can actually be improved due to better speeds. New capacities will permit far greater flows in actual transport traffic. Plans can go forward once more for an air line to "Down Under."

Which brings us to a point where we should take up the second character of this enterprise and consider its significance as a development in air line achievement.

Have you been long enough in this industry to remember how remote even trans-Atlantic airplane service seemed ten years ago? Planes that could be counted on for day-in-day-out reliability over 2,000 miles of open sea were still a dream—let alone planes that could make such crossings with commercially practical payloads. Men who had made even one ocean crossing were still considered as demi-



operations in that country but has made our long Pacific skyway more vital than ever to American interests in the Orient

gods by the public. Navigation from fast moving, unsteady planes was still an almost unknown art. No one even thought seriously of an airplane service across the 9,000 miles of the mid-Pacific.

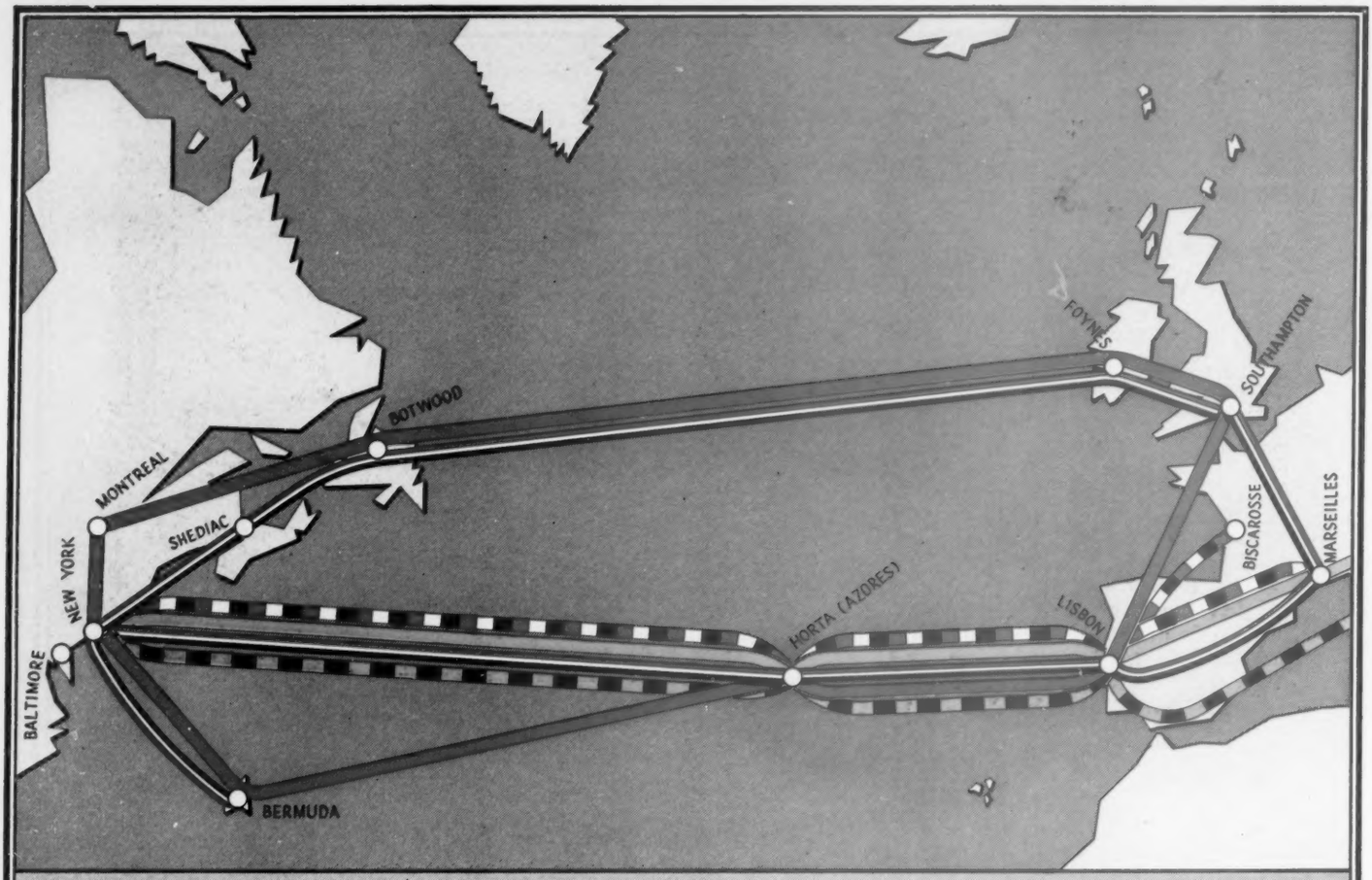
Perhaps such services might still be years beyond our capacities save for one circumstance, which at the time seemed only a troublesome hindrance: Pan American's first tiny route between Florida and Cuba was *over water*. To link South America with the Eastern United States, it had to cross a great deal more water. To cross water with an air line meant tackling a host of problems that had never yet been solved.

It meant, from the first, that Pan American should be one of the most aggressive exponents of multi-engined transports. It meant that the new

(*Turn to page 48*)

RALPH W. BEECHER
Division Engineer

CAPT. JOHN H. TILTON
Division Chief Pilot

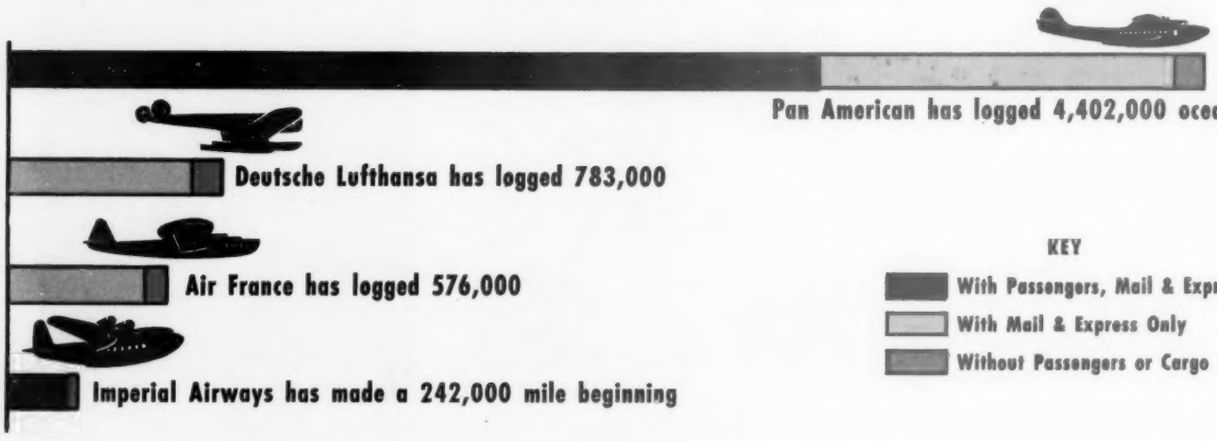


AVIATION TRADE ROUTE MAP
of the NORTH ATLANTIC

U. S. A. BRITISH FRENCH GERMAN ITALIAN

All Lines (Save NEW YORK-BERMUDA, Already In Operation) Represent Merely The Most Probable Routes Each Nation Will Establish

Our Lead in Ocean Flying Should Be A Priceless Atlantic Asset


Pan American has logged 4,402,000 ocean miles
Deutsche Lufthansa has logged 783,000
Air France has logged 576,000
Imperial Airways has made a 242,000 mile beginning
KEY
With Passengers, Mail & Express
With Mail & Express Only
Without Passengers or Cargo

These are totals to Feb. 1, 1939 for all flights in the Pacific and the South Atlantic, for survey crossings between the U. S. and Europe and for the U. S.—Bermuda service.

BLUE RIBBON BATTLEGROUND

The Air Powers of the World approach the establishment of air transportation across the North Atlantic as the contest-of-contests for prestige upon the trade routes of the future. After a ten-year campaign to win the necessary rights, Pan American Airways stands on the threshold of gaining a priceless head start over all its rivals.

IT STILL SEEMS to be a mystery to many people, "why Pan American tackled the Pacific before the Atlantic." There is obviously a great deal more traffic to be tapped on the Atlantic. It is only 3,400 miles from New York to London; it is 9,100 from Alameda to Hong Kong. The former presents 1,995 miles from Newfoundland to Ireland as its longest stage; the latter includes Alameda-Honolulu at 2,460. If Pan American was technically ready to set up a service in the Pacific in 1935, why didn't it apply that same technique, those same men, those same Clippers to the shorter, easier, more commercially attractive route?

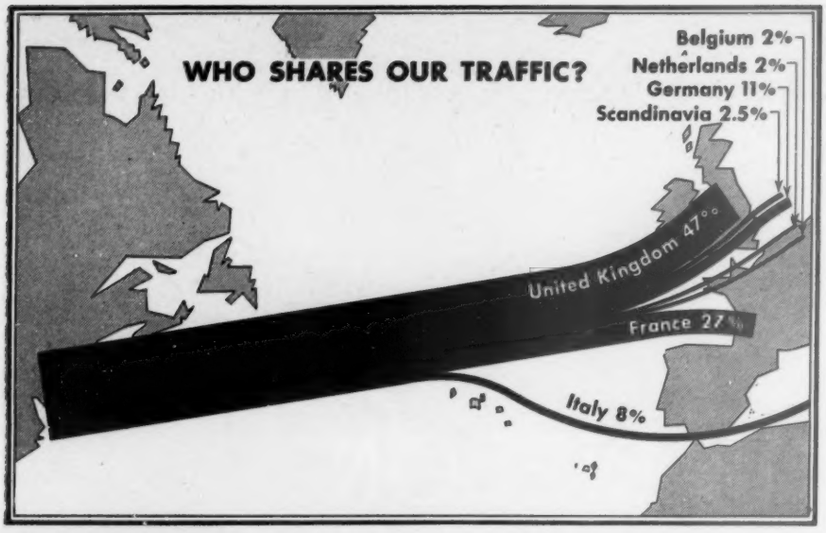
The answer: (1) In 1935, Europe was rapidly nearing completion of an air line network that threatened to tap the rich Eastern Asiatic markets while this country was still three weeks away by steamer. The set-up on the Atlantic, as we shall see, offered no such immediate competitive necessity from the *national* point of view. (2) The Pacific, due to the fact that Hawaii, Midway, Wake and Guam are U. S. territory and the Philippines are still beneath our wing, presented no question of operating privileges right up to the coast of Asia. The path to Europe, however, has been as hard to clear, diplomatically, as any international air route has ever been or probably ever will be.

The geographical set-up is simple. Until flying boats are built which can carry big payloads and ample fuel reserves all the way between the U. S. and the continent of Europe non-stop —and even the Boeing 314 can't do that—it is necessary to use refueling bases to break the journey. The map of the North Atlantic presents three such routes: One via the Far North including stops in Newfoundland, Labrador, Greenland and Iceland. A second including stops at Newfoundland, Ireland and England. A third to the south with stops at Bermuda and/or the Azores, and at Lisbon in Portugal.

Now on all three of these routes the British hold a key territorial position. The middle route is completely within the Empire. On the northern route it holds Newfoundland and Labrador. On the southern Bermuda. In addition, British influence with Portugal has been traditional for centuries. Any clearing of an American air route to Europe became therefore at the outset a matter primarily of effecting an understanding with our Anglo-Saxon cousins.

Now let us try to grasp what really is at stake. Certainly there is considerable traffic awaiting air transport on this route. No one knows just how much, because no one can foresee just what proportion of the present flow of steamer traffic will use the air line service, but at least it promises to be larger than on any other trans-oceanic route in the world. Especially if a considerable part of first-class trans-Atlantic mail comes to be dispatched by air, this route has strong commercial attractions.

But once more the *national* aspects



ALL THE TRAFFIC—between the U. S. and Europe, obviously, originates or terminates in this country. This chart shows how the flow divides at the other end of the line. It is based on figures for Passenger Travel of the First and Cabin Classes—should therefore be a good index of each nation's air traffic potentialities.

far outweigh the direct commercial ones. Our trade with Europe, will be quicker of pace. Our ties with European peoples will be closer-knit. But here the set-up differs from that which drew American and European air lines into a bitter rivalry to reach market areas in Latin American and Asia. Here two rival industrial centers are planning to run space-shrinking services to each other. Theoretically any trans-Atlantic air service would equally serve the ends of both Europe and America no matter who ran it.

However, this North Atlantic trade route has come to be the World's No. 1 Transportation Showcase. Steamship officials can tell you endless tales to prove the value of North Atlantic "window dressing" in shaping travel and shipping habits on all the seven seas. Hence the Queen Marys and the Normandies, the Romas and the Rexes, the Bremens and Europas. So, now in air transport, a leadership established or a triumph scored by a nation's airplanes on this route will reflect priceless prestige upon that nation's entire aeronautical industry. Upon the share a nation plays in air transportation across this blue ribbon battleground, may well depend its world-wide standing on the aerial trade routes of the future.

And just what the physical share of each nation will be in trans-Atlantic service, remember, is not, as in ocean transport, a function of its willingness to build and operate ships, but of the permission it can win from the countries to which it would operate. Little wonder, then, that it was not until late in January, 1939, that Pan American Airways stood at last in a position to apply to our own Civil Aeronautics Authority for permission to establish a complete trans-Atlantic air service.

It had been a full ten year battle, too. As early as 1929 the busy young executives of the swiftly growing airline took time to look into the situation. In 1930 the French air line company. Aéropostale, complicated the issue by leasing from Portugal what amounted to exclusive air rights into the Azores. That year Lufthansa's Von Gronau began survey flights across the Iceland-Greenland route and the British began looking over Bermuda as a potential Atlantic "stepping stone."

If America was to have a foot in the door, it was high time something was done. And Pan American did it. Rights to use Greenland and Iceland were obtained. Great Britain, Canada, Newfoundland, Ireland, Bermuda were approached, and indicated a willingness to consider granting air rights to Pan American subject only to the prior interests of an air carrier of the British Empire. Application was also made to Portugal for flying rights into Lisbon and the Azores.

That was not all. Pan American

CAPT. A. E. LA PORTE

CAPT. HAROLD E. GRAY

CAPT. CHARLES LORBER

Veterans of years of big-boat service over the Caribbean and the Pacific, these Master Pilots of Ocean Flying Boats are among those

had learned from its Latin American experience that while air rights are of first importance, arrangements for proper ground facilities were equally vital. It knew, too, that neither Great Britain, France or Germany would ever permit a foreign company to establish air bases within their territory. That meant permission must be secured to use the bases of each country's own air trust. Hence, Pan American set about establishing assets of its own it might offer those companies in return for such privileges. Five expeditions, some of them entirely its own, others shared jointly with educational research foundations, were dispatched to ferret out meteorological secrets of the Greenland-Iceland belt whence comes so much of the Atlantic's notorious weather. In 1931 Pan American set up an amphibian service from Boston to Halifax, Nova Scotia, in essence a "Trans-Atlantic laboratory" from which came much first hand information concerning flying weather and conditions in these latitudes on a Great Circle course toward Europe. Meteorological experts and operations engineers were dispatched to the Azores and back and forth across the shipping lanes, assembling other tables of first hand weather and operations data. In 1933, it sent its Technical Adviser, Col. Charles A. Lindbergh, out across the Greenland route in a long first hand flying survey.

Hence, when Pan American offered to share with Europe's potential trans-Atlantic operating companies, its research data, its bases and its radio, weather and other technical facilities, in exchange for similar considerations, assent was forthcoming. Pan Amer-

(*Turn to page 30*)

CAPT. R. O. D. SULLIVAN
ready for transatlantic service.

American Export Air Lines

With all of the broad Atlantic and with a considerable volume of business in passengers and mail in prospect, it is not strange that a certain amount of competition is developing within our own borders for trans-Atlantic honors. It is not to be wondered at, either, that a company that is already established with a fleet of vessels and a flock of shore bases on each side of the Atlantic would become actively interested. American Export Steamship Lines has always felt that its job was to render trans-Atlantic service in the broadest sense without regard to any particular medium or vehicle. Once the airplane arrived at the stage of being a practical instrument for long-range work it was only natural that American Export should study the possibilities of air transport over its present route to the Mediterranean. Unfortunately, however, Mediterranean traffic accounts for only some eight per cent of the total First Class and Cabin passenger traffic between the United States and Europe, so it was also natural that it should cast its eyes on the possibilities in the other 92 per cent.

In the past two years, surveys have been made of traffic possibilities and of operating problems to Europe, equipment both here and abroad has been studied and certain diplomatic moves have been made to insure operating franchises to key ports.

Some months ago American Export Air Lines announced that a working agreement had been reached with Italian transportation interests, including Italian Steamship Lines and the Italian air line, Ala Littoria. It is expected that the combined surface fleet of American Export and the Italian Lines will provide floating weather stations and communication stations for the trans-oceanic aircraft of both nations.

Because of pressure for delivery by other operating companies, American Export Air Lines was unable to purchase any 4-engined flying boats for operation this year. It has bought, however, a new Consolidated PBY-4 which is scheduled for delivery about the first of March and which will be used for survey flights during the spring and summer of 1939.

JAMES M. EATON
Executive Vice-President

Again it is only natural in going into this flying business that American Export should draw on the existing aviation industry for experienced personnel. James M. Eaton, formerly with the Pan American Airways and more recently head of the Ludington Lines has had the job of organizing American Export Air Lines. It has been recently announced that D. G. Richardson, long Operations Manager of Pan American's Western Division will be Operations Manager of the new company. Edmund T. Allen will test fly the Consolidated survey ship and will then turn it over to a selected crew of six who will conduct flying operation this summer.

American Export Air Lines begins its career with many years of seagoing experience behind it. The parent company, American Export Lines now operates a fleet of twenty-four vessels between North Atlantic ports of the United States and the Mediterranean and Black Sea ports. Its officials are men of long standing maritime and transportation experience and include W. H. Coverdale, president, John E. Slater, vice-president and general manager, and John Dehan, vice-president and European director.

FOR SURVEYS: American Export will use a Consolidated PBY-4

ican then, as a result, was assured of base facilities in Canada, Newfoundland, Ireland, England, and Bermuda, in France, and in Germany.

When, in 1933, the French lost their rights in the Azores through nonperformance, Pan American and Imperial stepped in to press for action on their applications. When, three years later, the Portuguese government saw fit to approve them, the last base was checked off the list of "things to be done".

On July 2, 1935 President Roosevelt set up an Interdepartmental Committee composed of Assistant Secretaries from the departments of State, Commerce, Post Office and the Treasury to consider "the development of American air transport lines in foreign territories."

In December of that year, a delegation arrived from Great Britain, Canada and Ireland to discuss the North Atlantic with the newly formed committee.

Exactly what then transpired has never been revealed since the proceedings were largely of the "behind locked doors" variety. But this much is clear: (1) In spite of an invitation for "anyone interested" to turn up, Pan

(*Turn to page 33*)

How the Atlantic Will Be Flown

I—A Bow to Andre A. Priester

THERE IS A COMMON DENOMINATOR recognizable in every well-practiced action of a Pan American flight crew; in every P.A.A. maintenance routine; in the spic and span orderliness of every P.A.A. base from Hong Kong to Lisbon, from Nome to Buenos Aires. It is obvious even to the casual observer.

The men seem to be working, not at trades, but at professions of which they take pride in being the well-equipped masters. The tools and gear with which they work, the equipment upon which they lavish their efforts seem as new as the day they were purchased. The pattern of their actions, no matter how strange the circumstances, gives an overwhelming impression of preparation long ago for just this or that situation.

A professional outlook, a regard for equipment almost akin to worship, a quality of pre-planning for any conceivable contingency—a world scattered force of some 5,000 men become uniformly imbued with such qualities not by accident, but by design. And the design is that of a magnetic, intense little Dutchman named André Priester who has been Chief Engineer of Pan American Airways since that air line acquired its first airplane from another Dutchman named Anthony Fokker.

A complete exposition of the Priester philosophy of air transportation would fill a bulging, though fascinating book. It would start with an impassioned sermon on Safety, Conservatism, and Responsibility. It would proceed with a hard-headed, realistic analysis of the difficulties faced and the hazards involved. Then proceed to forestall each difficulty and each hazard—not en masse, but one by one. Men, machines, bases; technique, maintenance, order; character, quality, completeness. No program of preparation is too long, no process of development too difficult; no goal too visionary, if transport aviation by adopting it can move toward safety.

ANDRE A. PRIESTER
Chief Engineer

Priester, himself, would explode if you ascribed to him the credit for making Pan American by far the safest big international airline in the world. That, he would tell you, belongs to the thousands of hard-working men representing P.A.A. over half the surface of the globe. He would tell you of the technical contributions of such P.A.A. department heads as Hugo Leuteritz, who developed the line's unique radio direction finders. Of the work of Division heads and engineers, of operations managers, of pilots and mechanics. He could tell of progress made on Pan American problems by almost every unit in the American aeronautical industry— sometimes on urgent appeal; frequently on their own individual initiative. But any crusade must have a leader to set and keep alight its fire. And, these men in turn, would tell you he is Priester.

When you step down the beautifully glistening dockway for your first trans-Atlantic voyage by Pan American Clipper, remember some of this. The ship you board will be huge and rugged for all its interior luxury. It can remain aloft indefinitely on any two of its four engines. Five men of the crew of eight upon its flight deck, can fly it, navigate it, run its radio or its four engines. Mechanics can reach every foot of fuel line or make repairs upon its power plants in flight. Fuel will be ample to carry the ship great distances beyond each objective. A foot-long list of emergency boats, and flares and gear takes 1,100 pounds from the plane's precious payload rating. Other hundreds are willingly expended on de-icing shoes. Each minute of the flight, a half dozen radio stations stand steady guard, to warn of storms, to give a path, to dispatch rescue. As far as unsparing human effort can make it so, your flight will be a safe one. These things trace directly back to André Priester, now one of America's most useful citizens.

PAN AMERICAN AIRWAYS TO ASIA...TO EUROPE

Powered by WRIGHT CYCLONES

Spreading their huge wings, a fleet of Pan American Airways Boeing-type Clippers, each powered by four 1500 H.P. Wright Double-Row Cyclones, will soon be speeding Westward from San Francisco to Honolulu, Manila and Hong Kong, China . . . and Eastward from New York to London and Paris.

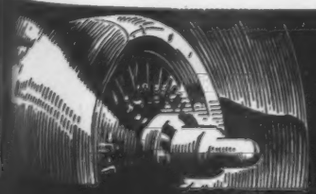
"Pan American Makes the World Smaller" is emphasized by the proposed schedules for the new trans-Atlantic and trans-Pacific operations . . . approximately a day from the United States to Europe . . . 5 days from America to China.

The 74-passenger Pan American Airways Clippers are by far the world's largest and most luxuriously equipped airliners. The Boeing 314, with its two decks, 18 separate rooms, soft carpeted floors, davenport-type lounge chairs and modern styling throughout, is virtually a "Park Avenue Suite on Wings."

Powered by four 1500 H.P. Wright Double-Row Cyclone 14 engines—a total of 6000 H.P.—the new Pan American Airways Clippers are capable of sustained flight on any two engines, giving a tremendous reserve of power for normal cruising operations. The Wright Double-Row Cyclone 14 is a type accepted in production quantities for extensive use by our Government Services.

"Fly With Wright The World Over"

WRIGHT AERONAUTICAL CORPORATION
PATERSON NEW JERSEY
A Division of Curtiss-Wright Corporation



WRIGHT *Aircraft* ENGINES

PESCO *flies the world's airways with* PAN AMERICAN

Carrying the message of American Aviation Supremacy to countries on both hemispheres, PAN AMERICAN is performing an outstanding service to our industry. PESCO products are making a definite contribution to the record dependability of PAA planes, and we take pride in the fact that the new Boeing 314's soon to be put into Trans-Atlantic and Trans-Pacific service, have standardized on PESCO fuel, hydraulic and vacuum pumps.

Pesco products on the Boeing 314 include engine-driven fuel, vacuum and hydraulic pumps, electric-motor driven fuel pumps and hydraulic pumps for Hydromatic Feathering Propellers.

PUMP ENGINEERING SERVICE CORPORATION

12910 TAFT AVENUE · CLEVELAND, OHIO, U.S.A.

American was the only American group to send representatives. (2) Our own government seemed to be learning for the first time of the tremendous value placed upon aerial operating rights by the rest of the world. (3) The incident decided Washington to take up negotiations for American companies to operate abroad, as a direct governmental function. That same winter Germany and France both sent delegations to Washington for similar conferences.

As one result each of the four nations was granted "experimental" privileges by the others to cover whatever "survey" or "training" flights it felt necessary. That summer Germany was first to take advantage of this arrangement and made a number

(*Turn to page 36*)

How the Atlantic Will Be Flown

II—The Crew

THE MEN on the "flight deck" of a trans-Atlantic Clipper form one of the most unique groups on earth—and one of the hardest to get into.

Not counting the stewards in the big passenger cabins, a trans-Atlantic crew will consist of at least seven men: a Captain; a First Officer Pilot; a Second Officer Pilot; a Third Officer Pilot-Navigator; an Engineer Officer; a Radio Officer, and a Junior Flight Officer.

The Engineer Officer and the Radio Officer are specialists, long-trained in the operation of power plants and radio, respectively. In addition they have been equipped with ample theory and shop-experience to enable them to trace trouble and rectify it whenever it is possible to do so in flight.

The Third Officer Pilot-Navigator is in direct charge of charting the plane's position by celestial navigation, by dead reckoning, and by radio bearings taken on the plane by surface stations or by bearings taken from the plane on surface stations.

The First and Second Officers Pilot share the bulk of the flying duties. The Junior Flight Officer may be sitting in the co-pilot's seat, helping with the navigation, serving the Engineer Officer by inspecting fuel tanks, fuel lines, or the big engines themselves.

Over it all, or rather behind it at a desk-table, lords the Captain in executive charge of the plane, its flight and every one upon it. He might handle the plane's controls as little as an hour on an entire ocean crossing —or even not at all.

But this is more than a mere subdivision of continuous labor. Note that five of the seven—that is, all but the Engineer and Radio officer—are pilots fully qualified to take the ship off, fly it, and land it. In addition all these five have been thoroughly trained in navigation, in radio and in handling the engines. As a result, a simple schedule of duty rotation gives each officer one hour of rest in every four—and there are bunks in a crew cabin behind the flight deck to permit complete relaxation.

There is no royal road to the Captaincy. All pilots entering Pan American service are college graduates, most also are graduates of Army or Navy flight training centers and have had a year or two of active military or naval duty. Their first rank with P.A.A. is that of Apprentice Pilot. As such, for two years, they work in maintenance shops, serve turns of duty in Pan American offices to acquaint themselves with the work of all departments, and qualify for both Airplane and Engine Mechanics certificates.

Meanwhile they have begun a course of study toward examinations for advancement in grade. Most take correspondence courses prepared for their special benefit by P.A.A. technicians and administered through one of the big correspondence schools. As one specific objective he must qualify for a Second Class Radio License. Then, after handling a stiff set of written and practical examinations, the apprentice graduates to the rank of Junior Pilot, Second Class.

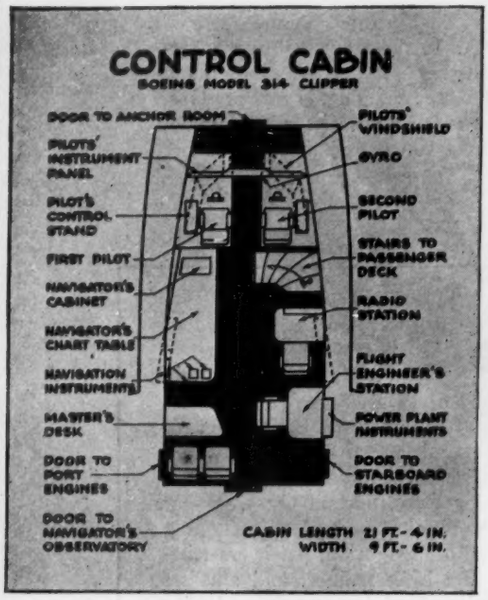
As he checks out in dead reckoning and radio navigation, basic meteorology, the Link trainer, and amasses flying time, he can move up to Junior Pilot, First Class.

At least one year later, he may face another set of examinations for rank as Senior Pilot—this time in subjects including international law, basic celestial navigation, seamanship, and the history and cultural background of countries served by P.A.A.

Even then he is not through. After 2,500 hours in command of P.A.A. aircraft (at least 500 in flying boats of more than 17,000 lbs. gross) he may sit for further examinations in advanced navigation and some eighteen other subjects—and if, meanwhile, he has had an excellent record and shown outstanding ability as a leader and manager, he *may* win through to the rating: Master Pilot of Ocean Flying Boats.

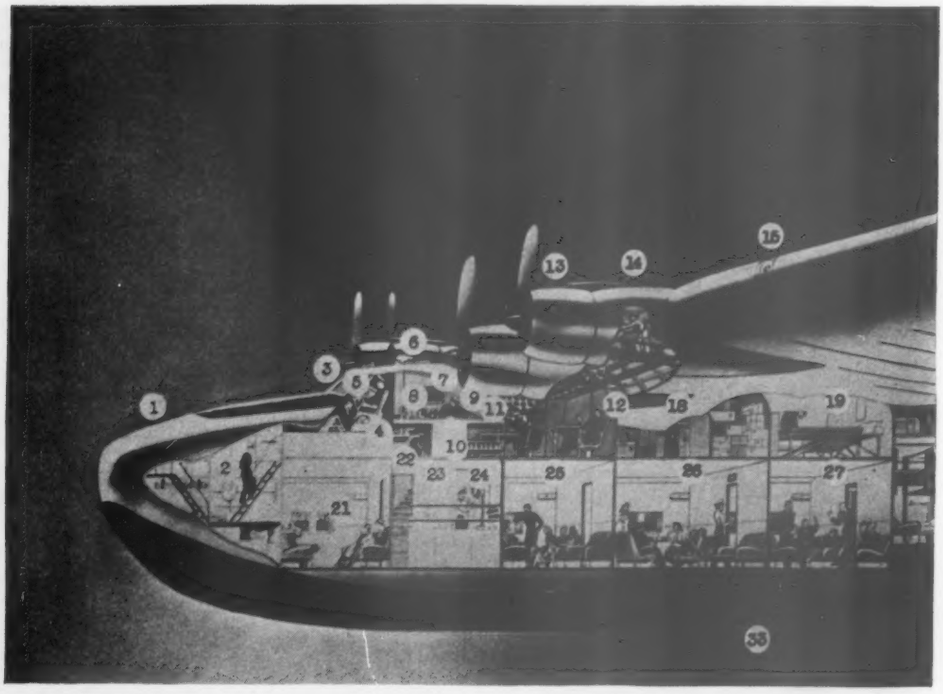
You'll find one on the bridge of your trans-Atlantic Clipper.

How the Atlantic Will



IN SPLENDID ISOLATION: A Boeing test crew rests on the flight deck after a final check flight. To keep down fatigue on long crossings, this compartment has been as elaborately sound-proofed and upholstered as the passenger quarters on the deck below. Note the simplicity of the pilots' panel in the bow.

THE HUGE HULL—is 106 ft. long, has a beam of 12 ft. 6 in. and a maximum depth of 19 ft. It has an athwartship main step and a pointed rear step equipped with a water rudder.



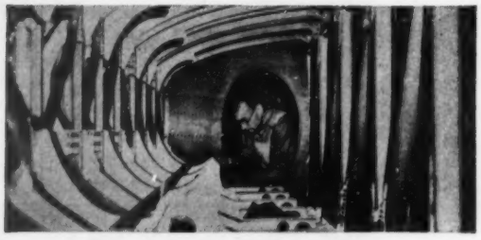
BY THE NUMBERS: (1) Anchor Hatch. (2) Seaman's Compartment. (3) Bridge. (4) First Pilot. (5) Second Pilot. (6) Radio Loop. (7) Navigation Compartment. (8) Radio Officer's Post. (9) Chart Room. (10) Navigator's Equipment. (11) Engineering Officer's Post. (12) Captain's Office. (13) 1500 hp. Wright GR-2600-A2 Cyclone Engines Equipped with Hamilton-Standard Hydromatic Propellers. (14) Mechanic's Wing Station. (15) Controllable Landing Lights. (16) Wing Spread

7,200 POUNDS—of the planes gross 82,500 consists of furnishings installed for the comfort of its occupants. Sound-proofing, and air conditioning is well-nigh perfect. Big triple-seat davenports make up into upper and lower berths, 75 inches long, 32 inches wide. A galley serves hot meals. Six seating-sleeping compartments and a dining room-lounge give each passenger more room than any other plane

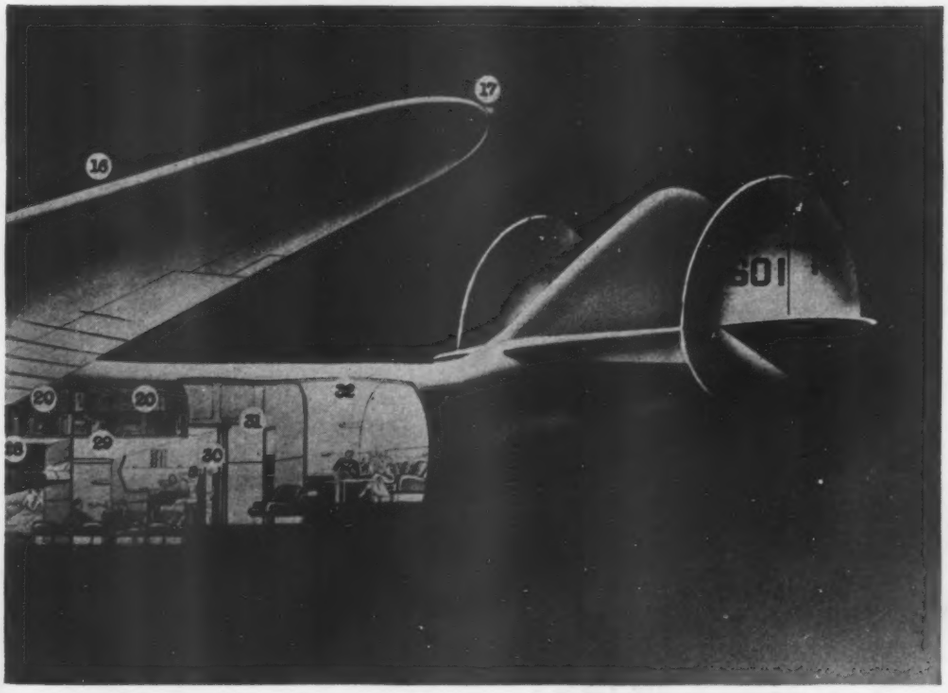
be Flown III. The Planes

RADIO STATION AND ENGINEER'S POST: The Radio Officer has three transmitters, three receivers. The Engineer Officer has complete controls for all four engines and 26 instruments with which to watch their functioning. Most of them are dual indicators. The large black one gives readings of base and head temperatures at 16 points.

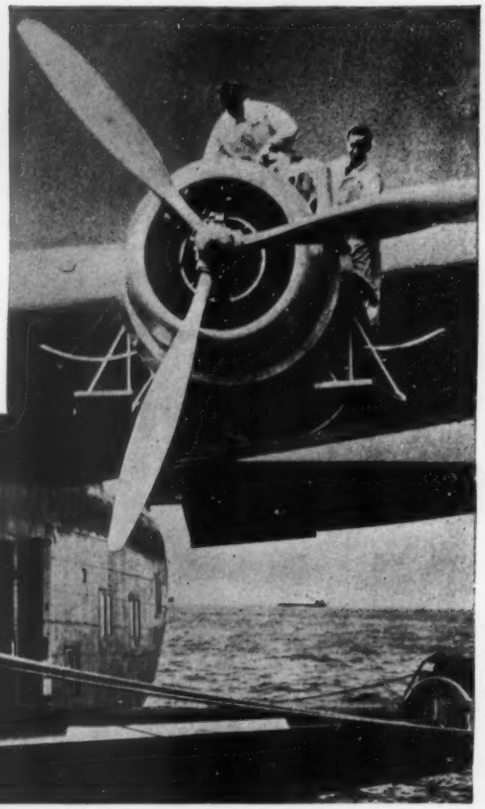
UNIQUE FEATURE: The Boeing-314 is the first transport plane big enough to permit mechanics access to the engines in flight—

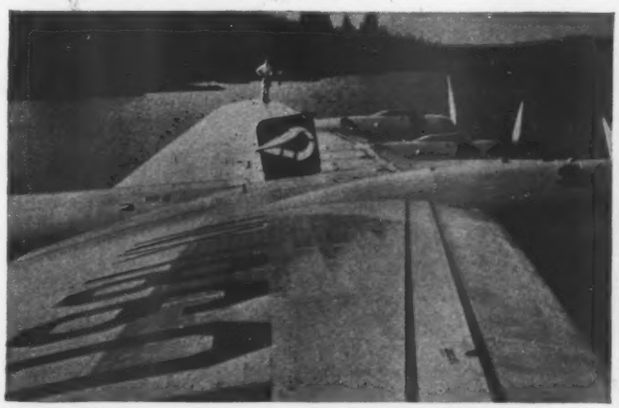


—through wing passageways like these.

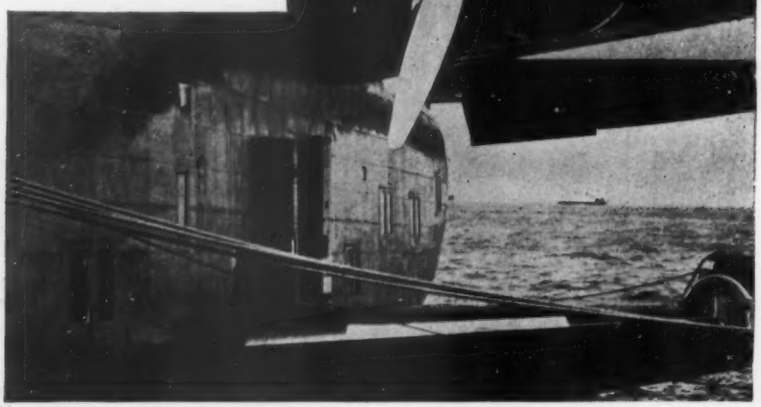


152 ft. (17) Navigation Light. (18) Main Cargo Hold. (19) Crew's Sleeping Quarters. (20) Luggage Holds. (21) First Passenger Compartment (for ten persons). (22) Spiral Staircase to Bridge. (23) Men's Room. (24) Galley. (25) Second Passenger Compartment. (26) Dining Lounge. (27) Third Passenger Compartment. (28) Fourth Passenger Compartment. (29) Fifth Passenger Compartment. (30) Ladies' Room. (31) Sixth Compartment. (32) Private Suite. (33) Auxiliary Hold.

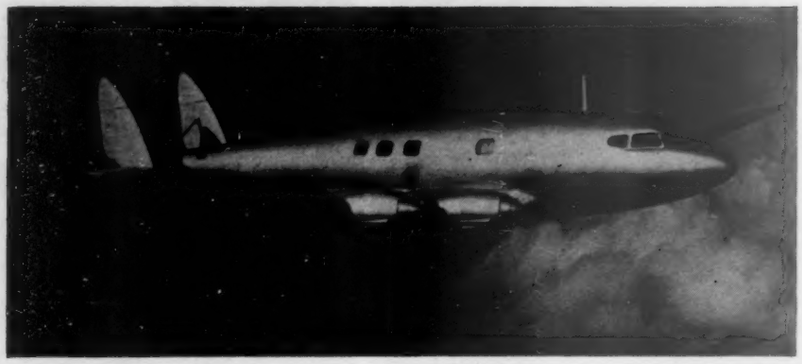




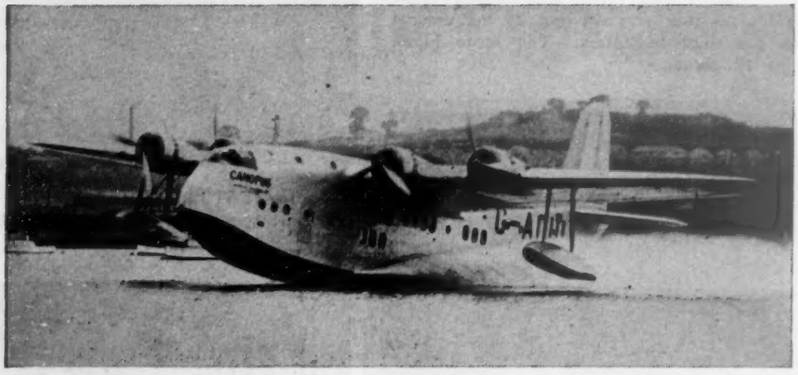
THE BIG WING—has a span of 152 ft.; an aspect ratio of 8.05, [illegible] (NACA 0018 tapered to 0010). Leading



ON THE WATER: Mechanics can reach the nacelles through the wing, unlock these work platforms and service any part of the engine. Note the big



THE BRITISH—will be back in June to open an experimental air mail service using landplanes like this four-engined DH Albatross . . .



AND FLYING BOATS—like this Short Brothers ship of the Empire class, strengthened to carry bigger loads and equipped for refuelling.

THE GERMANS—will once more demonstrate their mothership, their catapults, and their sleek seaplane mail carriers. Bigger planes are in prospect.

FRANCE PROPOSES—an active part in this summer's surveys. The Lieut. de Vaisseau Paris will make crossings. Others will be made in newer, if smaller, equipment.

of crossings between the Azores and the U.S. using the same technique of catapulting flying boats from mothership steamers it uses in crossing the South Atlantic. In 1937 Pan American and Imperial joined Germany in an active program, Pan American using a Sikorsky S-42B, Imperial a specially fitted Empire Boat built by the Short brothers.

Intergovernmental Agreement

Washington's new international air-consciousness bore other fruit. In 1936 an intergovernmental agreement was reached with Great Britain whereby each would grant to authorized airlines of the other necessary operating privileges subject to the stipulation that neither service should start before the other was ready to do likewise. Since Imperial Airways was the "chosen instrument" of His Majesty's government, the United States proceeded to grant its prompt application for operating rights. Similarly, Pan American, being the only American company interested, at that time, was successful in its application to the British government. Subject only to the governing "reciprocity of service" clause in the agreement of the two governments, Pan American then was in possession of the necessary air rights, and (through its agreement of cooperation with Imperial Airways) of access to all necessary base facilities to operate service between the United States and Great Britain, via Canada, Newfoundland and Ireland and between our mainland and the islands of Bermuda.

In June, of the next year (1937) both companies established alternate, but commercially competitive services, between New York and Bermuda.

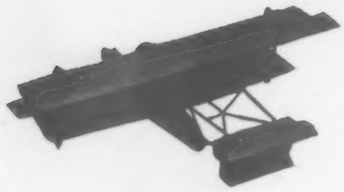
What further will be accomplished remains to be seen. Germany in 1937 announced it was ready to set up a permanent air mail service forthwith. Washington, taking the stand that it would grant no rights for such a service until an American company was ready to operate a service to Germany on a trip-for-trip basis, turned a deaf ear. A similar plea from Germany following another extensive program of flight demonstrations in 1938 got nothing but the other ear, equally deaf.

So far the American position was well taken, but an iron-bound trip-for-trip plan when eventually worked out may well prove a boomerang. Outside a trickle of traffic that moves across from the United Kingdom direct to Canada, all trans-Atlantic travel originates or terminates

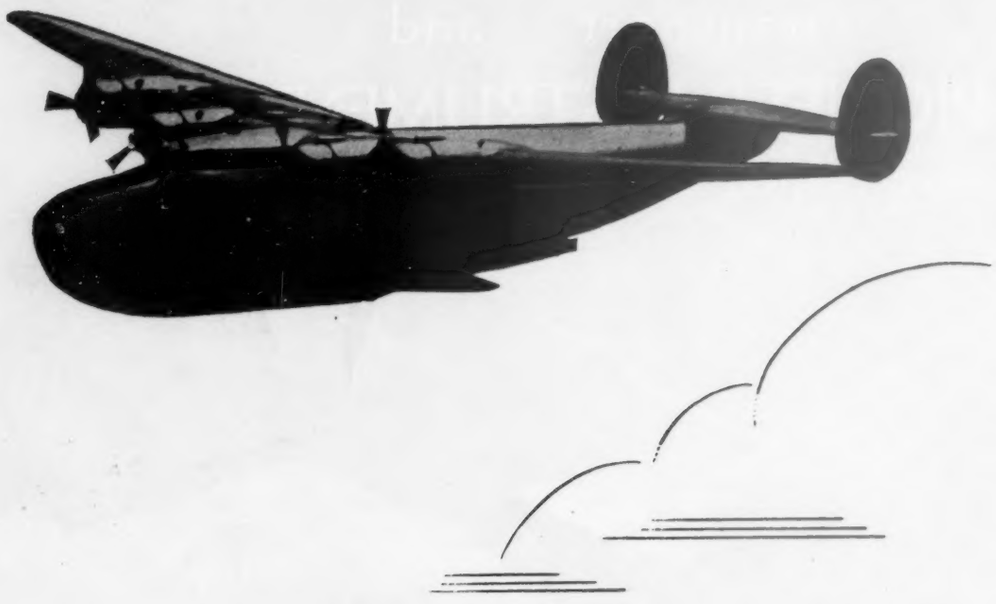
(Turn to page 39)

Pioneering
has made
American international air
transport . . . and
PIONEER INSTRUMENTS
have helped, every mile of the way!
Active participation in every forward trend in aviation is a familiar responsibility of Pioneer Instruments . . . but it will never become an "old story" to Pioneer craftsmen. It is too inspiring.
Pioneer "Autosyn" remote indicating instruments as well as flight and navigational instruments are customary equipment on America's transport aircraft.
PIONEER INSTRUMENT COMPANY, INC.
(Subsidiary of Bendix Aviation Corporation)
BENDIX, NEW JERSEY

From the Great Exploit of the NC-4



To this Year's Epic Passenger Trip of the Boeing 314



Haskelite Has Crossed With EVERY American Trans-Atlantic Flyer

● The "luck" of Trans-Atlantic flights, they say, consists of infinite care in every detail of preparation. It certainly must be more than coincidence that every American-built plane planned with such great care has used Haskelite Aircraft Plywood in one form or another.

The Pan-American Boeing Plane, 314, which will link New York to Europe in a regular commercial service this year, is itself the culmination of all the planning in many planes, veterans of Atlantic flights which tested the efficiency of engines, designs and construction materials. Meeting all these tests, Haskelite, first used 20 years ago, continues for this top-flight service.

This outstanding fact sums up many others—that Haskelite combines in one material a desirable strength-weight ratio, good insulating and sound absorbing factors, and ability to take the curved forms suited to aero-dynamic construction. It is basic aircraft material made by basically air-minded engineers.

Invite their cooperation.

HASKELITE

HASKELITE MANUFACTURING CORPORATION

208 West Washington Street, Chicago, Illinois • Offices in Detroit • New York

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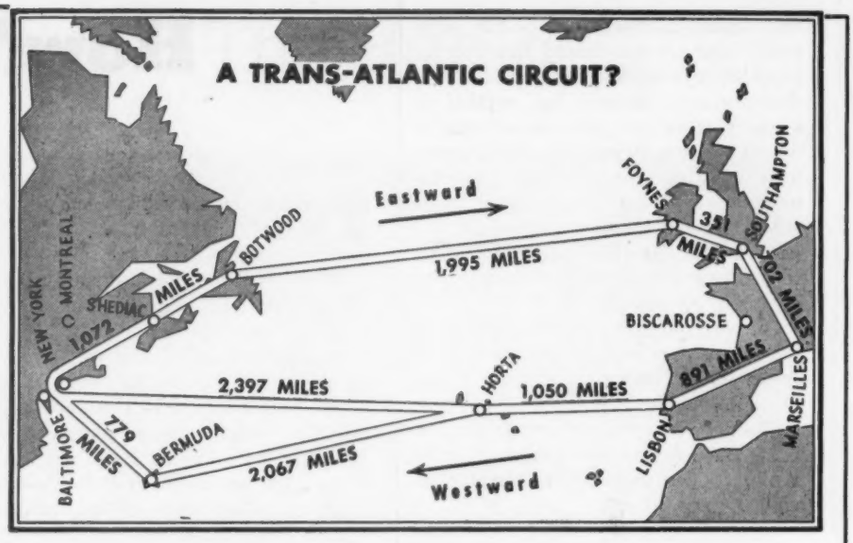
in the United States. As shown on the chart on page 28 the great bulk of it has its opposite terminal or origin in England or France. Now the most practical American service might well be one which touched say France and England, or even France, Germany, and England on a single trip. In return, on a trip-for-trip basis, each of these countries could run a flight to the U.S. and return. There is a great deal to be said therefore upon an insistence by our government that trans-Atlantic service should be allocated on a basis of the traffic each country actually contributes to the total North Atlantic flow.

Be that as it may, the Atlantic drama swept on through its laborious haggling over the script and trial rehearsals toward the lifting of the curtain. Contributing equally to the delay was the fact that none of the nations involved was actually prepared—granted all the rights in the world—to set up a permanent scheduled air line to carry mail, passengers and cargo. Germany could have carried only mail in its catapult planes. Great Britain might have set up a mail-only service in its Empire boats in its weird Mayo Composite or in one of its four-engined land planes—and probably will do so this summer. Pan American could carry a considerable mail load across the Atlantic in its Sikorsky S-42s, but short of halting the Pacific completely and shifting its Martins to the Atlantic, it could not have set up even a pioneering service for passengers.

Now swiftly in the past few months, the last parts of the picture fall into place. Pan American takes delivery on the first two of its big new Boeing-314 flying boats. Its crews are ready, trained through a decade of over water experience and some 269 crossings of an ocean three times the Atlantic's width. It has bases ready on Long Island, at Baltimore, at Shediac in Canada, at Horta in the Azores and Lisbon in Portugal. It has permission to use British bases at Botwood in Newfoundland, at Foynes in Ireland, at Southampton, England and the French base at Marseilles. So sure is it of its technique, it has told the Civil Aeronautics Authority it needs but a single shakedown cruise of the Yankee Clipper across to Europe and return before it will be ready to offer complete service for passengers and express, as well as mail.

Late in January, France announced it would welcome a Pan American service to its shores provided only,

(*Turn to page 40*)



How the Atlantic Will Be Flown

IV—The Route and the Weather

IT IS ALL TOO EASY to look at a map showing the great circle lengths of the various "practical" trans-Atlantic air routes and arrive at an obvious but highly inaccurate conclusion that there is one "best" one; that between New York and England via Newfoundland and Ireland. Its total length is substantially shorter than the Azores route; the longest uninterrupted over-water gap is only 1,995 miles, a little shorter than Bermuda-Azores and some 400 miles shorter than the direct New York-Azores crossing.

The error arises from the fact that trans-oceanic Clippers don't fly routes on great-circle charts but on weather maps—and upper-air weather maps at that. In the Pacific, for example, a flight along the "shortest" great circle course between California and Hawaii is a distinct exception—and flights routed 100, or even 300 miles or more to one side of that course (to take advantage of favoring winds or to avoid bad weather) are the common practice.

And on weather charts, such as those prepared daily by Pan American weather men for the past three years, the northern trans-Atlantic route loses much of its initial allure. Especially in the winter season, it is frequently torn by gales, menaced by icing conditions, laid deep in fog over Newfoundland, Ireland and England.

Swinging far off the Great Circle, and rising high "over the top" of the mess beneath does permit a plane to avoid many of these troubles—on eastward crossings. But, and its a big but, winds along this northern route are fiercely westerly in their habits. As altitudes increase, they increase in speed (frequently a 40 mile surface wind means one of 100 m.p.h. at little over 1,000 ft.) and are almost invariably from the westerly quadrant.

The Azores route, in contrast, is far more uniform the year around. The Atlantic off our own Eastern coast, of course, has its storms and occasional icing areas, but it is rarely unflyable. And its winds are neither so high in velocity nor so invariably tough to buck on western crossings.

Much is still to be learned. Consistent reporting of even surface conditions from North Atlantic vessels is hardly ten years old. Exploration of upper air conditions by pilot balloon is only now getting underway, although it is, fortunately, rapidly on the increase.

Until our basic "facts" should be proven wrong or until some new development renders weather hazards much less formidable, expect (1) A marked preference for the Azores route for winter service, (2) Some winter use of the northern route under good conditions, especially for eastward crossings, (3) Possibly even a circuit route: the Newfoundland route for a fast trip east; the Azores route for a longer but more certain return journey.

that when its own air liners were ready, the service would have to be adjusted to France's satisfaction or be discontinued. Britain, too, replied to a query from our government that it would have no objection to Pan American initiating a trans-Atlantic service using its territory as soon as practicable—a very sporting move on the part of a nation which had every right to insist on a wait until its own preparations were completed.

As we go to press, nothing remains, then, save approval by our own Civil Aeronautics Authority, and the fixing of mail rates by that body.

Once those are forthcoming, we turn to another bright new page of what Kipling once called "the chapter of endless possibilities."

J. CARROLL CONE
Manager Atlantic Division

CLARENCE H. SCHILDHAUER
Division Operations Manager

How The Atlantic

THE EQUIPMENT in the new Boeings is remarkable for its completeness, and at the same time for its simplicity. Two duplicate transmitters for use in cw telegraph service are available for the basic communication needs, and in addition a small radiotelephone transmitter for work within 30 miles of the surface stations. Likewise two duplicate cw receivers are provided for use in telegraph communication and for loop direction-finding. A telephone receiver, a companion to the telephone transmitter, is also aboard and is rigged up with an automatic switching system, for simultaneous use with the telephone transmitter.

The two telegraph transmitters, being identical, are thus available for alternate use in emergency. The frequency range covered is very wide; definite operating frequencies include 333 kc, 500 kc, 1638 kc, 3082.5 kc, 5165 kc, 5692.5 kc, 12,330 kc (the latter two for Atlantic service only) 8220 kc, 8240 kc, 8280 kc (this last for raising marine vessels). With such a wide variety of frequency service, crystal control would be very cumbersome. Consequently the transmitters are of the master-oscillator power-amplifier type, containing but two tubes, and delivering 80 watts output to the antenna. The master oscillator circuit is a special development of the PAA radio engineering staff and provides frequency stability comparable with crystal control.

Trailing antennas (which leave the ship through a retractable fairlead in under the bow) are used for the lower frequencies, but on the high frequencies, the great size of the ship makes possible efficient fixed antennas since an appreciable fraction of a wavelength can be strung from the wings to the tail.

Power for the transmitters is obtained from dynamotors, operated on the 12-24 volt system. The supply consists of 120-ampere hour batteries, charged from 15-volt 100-ampere generators driven directly from the plane's engines. On the water, a gasoline-driven generator may be used for charging. Kites are available in the plane for raising a long antenna from the surface of the water.

Until a few years ago, it was standard practice on all PAA ships to employ cw (code) communication only.

HUGO C. LEUTERITZ
Chief of Communications

But a modification of this regulation was introduced in 1937 to allow radio telephone communication for purposes of speeding up operations at or near the airport terminals. The range of the radio telephone equipment is limited to approximately 30 miles. The telephone equipment aboard the Bocings is of standard manufacture. The transmitter is a Western Electric Type 25A transmitter, which employs two 6L6 tubes, one as modulator, the other as crystal controlled oscillator. The nominal output power is 16 watts. The transmitter is operated on 2870 kc for Atlantic service, 3082.5 kc on the Pacific. The companion to the radiotelephone transmitter is the receiver, an RCA AVR-7G superheterodyne, a combination communication and beacon receiver, covering the range from 250 to 400 kc and from 2000 to 6000 kc. This receiver is operated as a unit with the 26A transmitter, the two being connected alternately to the same antenna through a remote-controlled relay switch.

The two communication receivers permit simultaneous cw telegraph and d-f work, act as companions to the two telegraph transmitters, and ensure duplicate reliability. These receivers, developed by PAA engineers,

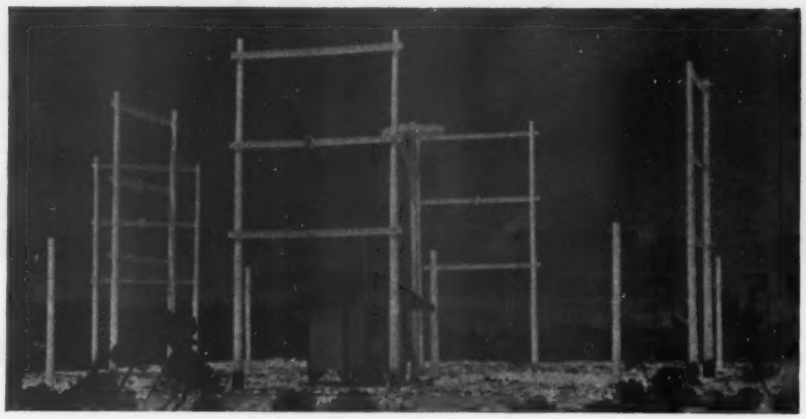
Will Be Flown V—The Radio

are outstanding examples of simplicity. Each receiver weighs but six pounds and covers, through the use of seven plug-in coils, the entire frequency range from 250 kc to 25,000 kc. The circuit employs a stage of untuned r-f, a regenerative detector, and two stages of audio frequency amplification.

Direction-finding equipment

Two methods of direction finding are available: one involving a rotatable loop on the plane, the other using bearings taken on the ship's transmitter by Adcock-system ground station direction finders. The rotatable loop system is used primarily as an adjunct to the Adcock system, and is of course subject to night effect and is limited to use over comparatively short distances. The Adcock system, on the other hand will give bearing accurate to within a degree over distances well over 1,000 miles, and is in addition practically immune to night-effect errors.

The direction-finding system on the plane consists of a rotatable loop mounted in a streamlined housing.



From company stations on Long Island and at Horta and Lisbon, already equipped with such sets of di-pole antennas as this, Pan American operators . . .

International

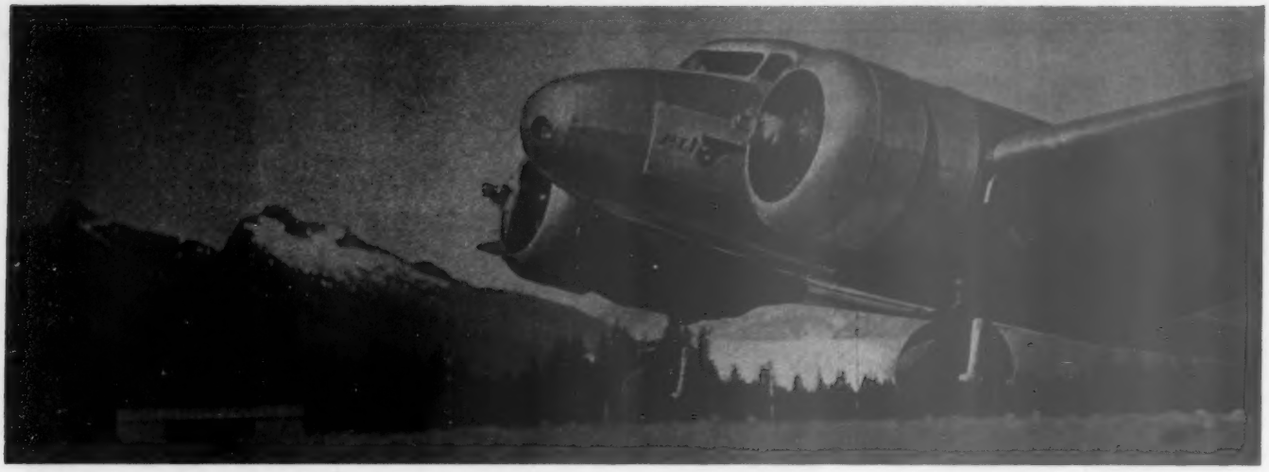
. . . can take bearings on Clippers in mid-Atlantic accurate to one degree. Comparable equipment will be available at several British stations.

The Clipper's Radio Officer can take bearings on any surface station.

The output of the loop is fed first to a single stage of tuned radio frequency amplification, and then to the input of either of the two standard communication receivers. The extra r-f stage is required to introduce additional sensitivity, to make maximum use of the capabilities of the loop itself. The indications of the bearing direction are taken by the aural-null method, using the headphones in the output of the receiver, while rotating the loop. The ground stations are provided with intermediate frequency transmitters and "T" antennas of symmetrical dimensions producing uniform field patterns for d-f approaches. The loops are much used for taking bearings on marine vessels, and for homing purposes.

The Adcock direction finder works on the output of the cw telegraph transmitter in the planes. Three Pan American Adcock installations are already available for Atlantic operations: one on the East coast of the United States, one in the Azores, and one at Lisbon in Portugal. Each installation consists of four vertical di-pole antennas, whose outputs feed carefully balanced receiver circuits. By detecting the phase differences in the signal received by the four di-poles, the direction of the incoming signal may be readily found, and radioed at once to the plane from which the signal is coming. The Adcock system covers readily any frequency in the range from 5 to 8 megacycles.

Elaborate radio installations are also carried aboard two big sea-going launches which are now stationed at the Azores.



North Toward the Orient

The Land of the Sourdough is an ideal arena for air transport. Up till now, a lack of government aid has slowed up progress. The C. A. A. has a splendid chance to change all that.

IN THE SUMMER OF 1932, when Pan American Airways bought up the assets of two nearly-collapsed air line projects in Alaska and merged them into the Pacific Alaska Airways, there were four basic considerations which justified it in so doing.

(1) Alaska had great strategic value in the world drive for air lines to Asiatic markets. Directly across the narrow Behring Straits lies Siberia and a skyroad to Russia. Within practical flying distance lie Japan and Manchukuo, each offering geographical access to China by a route which is actually shorter than the mid-Pacific air line which Pan American was to build.

(2) Alaska offered as excellent a training ground and laboratory for the development of an arctic flying technique as the Caribbean had offered for tropical and trans-ocean development. In 1932 it was still a possibility that the most practicable trans-Atlantic route might turn out to be via Greenland and Iceland. It is still possible that trans-polar, or at least trans-Arctic, air routes will eventually play an important part in the World's trade.

(3) The vast territory of Alaska itself offered an ideal field for air transportation. Highways and railways are almost non-existent. Toilsomely slow dog teams, as an only winter resource, and river steamers, operating on brief summer schedules, form almost negligible competition.

(4) The unlimited potentialities of an air route connecting Alaska and the U. S. further increased the attractiveness of entering the region.

How has it all worked out?

Beyond a doubt, Pacific-Alaska has acquired a gratifying mass of arctic flying lore. It has learned how to combat temperatures down to 60 degrees below zero as a routine procedure. It has developed practical and efficient heating shelters to bring engines from such temperatures to starting heats. It has learned to cover wings at night to avoid heavy layers of frost that might spoil the morning takeoff. It has developed hangars with temperature locks; ten-ton rollers for packing waist deep snow; rugged skis, complete with brakes; radio, proof against the North's weird magnetic high jinks.

There is no doubt either that the Territory has responded traffic-wise to the arrival of airplane services. Its total white population is only 40,000, yet last year Pacific Alaska Airways and various charter companies carried more than 20,000 passengers.

When on May 3, 1938 P.A.A. opened air mail service on its two-year old Fairbanks-Juneau service, the whole Territory felt in holiday mood. When it began survey flights last summer of an "outside" route from Seattle to Juneau, using a Sikorsky S-43, Alaska hailed it as the coming of a new day.

But for all this learning and all this acceptance of airplane transport, Pan American's Alaskan ledgers are written in heavy red ink. For this apparent air transport Paradise is far from perfect. Until the Civil Aeronautics Authority Act was passed, there was no provision for any real air mail contracts within the Territory. The best an air line could do in that direction was to win so-called star route contracts from dog-sled teams—at dog-sled prices and with dog-sled requirements for almost unlimited pick-up and delivery stops. The long-delayed mail contract for the Fairbanks-Juneau service was legally possible only because it could be broken into two "foreign extension" routes at White Horse.

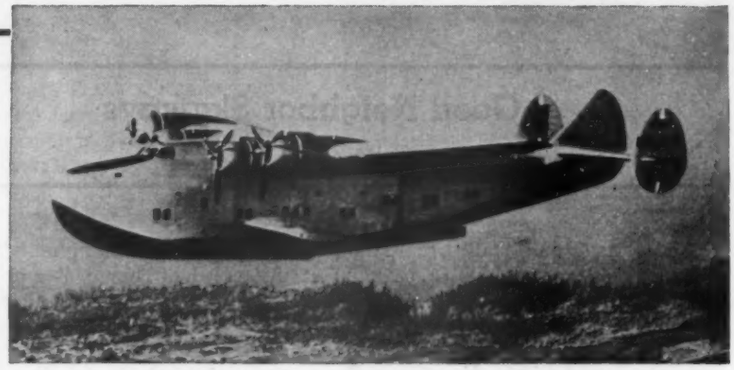
To complete the picture: Alaska has no natural landing fields or even many sites where airports can be cheaply built. Pan American and other private interests have sunk hundreds of thousands of dollars into airport construction, but even key airports are still so small that P.A.A.'s Lockheed transports represent the largest practical flying units in the Territory. With 500 pounds of precious payload consumed by Arctic gear; with a crew of three (two pilots and a radio-man-flight mechanic) dictated by safe operating requirements, with more capacity taken up with low revenue air mail—there just isn't enough payload capacity left to let an air line earn a living.

The new C.A.A. act may change all this. A moderate government investment in airports and airway aids, some fair mail rates, plus a connection with domestic U.S. air lines —and Alaska will indeed be one of the greatest of "air transport" countries.

Safety...

A MATTER OF BOTH OPERATION AND OF FORESIGHT!

SO, PAN-AMERICAN PROVIDES "INTERNATIONAL" FLARES AND SIGNALS



● Transportation, whether by rail, road, sea, or air, must overlook no opportunity to provide maximum safety under all conditions. It is therefore natural that, having developed its operating technique to the highest possible degree of perfection, Pan-American guards against even remote contingencies by equipping its ships with the most dependable Flares and Signals.

Complete information concerning these products will gladly be sent upon request.

Division of **THE KILGORE MANUFACTURING COMPANY**
TIPP CITY, OHIO

BENDIX-SCINTILLA

Aircraft Magnetos

are the ignition equipment
for all aircraft engines
operated by

PAN AMERICAN AIRWAYS

Good Neighbor Skyways

(Continued from page 21)

United States, and both France and Germany had plans which soon would have shifted the rest of Latin America into a similar position.

As a matter of fact, this wasn't even the worst of the situation. By the rules set up at a conference at Versailles in 1919, the international air is not free—each country has unlimited control of the skies above it, at least for all peacetime aviation purposes. As a result, the nations of Europe found early that each move in international air transport required elaborate diplomatic preliminaries. They found that "rights" could be secured by two methods: First, by bartering rights to operate over their own territory for reciprocal rights over the territory of other nations. Second, that the airline, as a private enterprise, could often secure rights on its own without committing its home-government to the granting of reciprocal rights in exchange. The most of the air rights in existence in the world today were cleared by this latter means—because of the obvious disadvantages of the former method. Especially, were such rights securable from nations having no air transport ambitions of their own who would grant important and sometimes even exclusive rights to a favored nation, to get the service for its own convenience. It was such important privileges as these which France and Germany had already in their grasp in many parts of South America eleven years ago.

This then was the situation when the young men who had organized the Pan American Airways as a tiny 90 mile route between Key West and Havana late in 1927, finally won a "go ahead" from Washington. They were organized, of course, as a private company and in the earliest stages of their search for operating rights had not even the prestige of U.S. mail contracts behind them. But they had their own high faith, the backing and assistance of many American industrialists who could see the vital necessity of their success, and the support of the whole American aeronautical industry.

The combination proved, fortunately, to be well nigh irresistable. Bit by bit they pieced together operating rights to this and that piece of key territory. Through the old Huff-Daland Dusters then active in Peru, they arranged to establish an air line in that country. They enlisted the powerful Grace Company in a drive to extend those privileges all along the West Coast of South America. The result was a company called Pan American-Grace Airways (still owned by Pan American and Grace on a fifty-fifty basis). Similar acquisitions brought in the West Indian Aerial Express in 1928 and cleared the way to Puerto Rico; Cia Mexicana de Aviacion in 1929; New York, Rio and Buenos Aires Line, Inc. (NYRBA) in 1930; a substantial interest in SCADTA in Colombia in 1931. What Pan American secured from the companies brought into the system were not operating rights—but necessary ground facilities. There were no rights acquired from the West Indies aerial Express, Cia Mexicana, Nyrba or others. Pan American even with these acquisitions had to negotiate its own rights to operate from the governments concerned. However, it did acquire the right to establish and maintain facilities in those countries—a matter which is often far more important than the technical operating rights, themselves.

Thus, step by step, route after route of a complete Latin American trunkline system was cleared as to air rights, bid on successfully for a mail contract, set into operation. By the end of 1929 no less than 12,265 miles of route had been inaugurated and was steadily carrying mails and passengers. By 1931, Pan American and its affiliates had completed their first objective—an air line network which swept from Texas down through Mexico and Central America; which bridged the Caribbean from Florida with two routes to the Northern Coast of South America; which completely girdled that continent.

It was indeed a splendid achievement. The immediate effect was to restore us our advantage-of-opposition in the contest for Latin American trade and to render it far more marked than ever before. American business men found they could now get an answer to a letter mailed to any part of the Caribbean area in little more than the time needed for domestic correspondence. That within the fortnight they look for a reply from countries as remote as Chile and the Argentine. Executives who formerly took six weeks off to interview a few agents in Rio or Buenos Aires now found they could in the same interval reach every important city in Latin America—and have most of the time available for business. Latin American customers began finding a distinct pick-up in the speed with which U.S. firms handled their orders and delivered their goods.

Of equal importance, several thousand specimens of our best young manhood began making friends with the peoples of three dozen countries as part and parcel of their job of running an air line. The new line set

W. O. SNYDER
Manager Eastern Division

CAPT. ROBT. A. FATT
Division Chief Pilot

H. W. TOOMEY
Division Engineer

up elaborate weather services which again and again proved helpful in warning of approaching storms and hurricanes. Hurricanes struck along the route, earthquake occurred. Each time the new Gringo air line was first to bring doctors and drugs and food and to evacuate the injured—without any mention of charges. Government officials, diplomats, writers, teachers, tourists began traveling on the new system. Remember that, by steamer, even Central America is further from New York than is Europe. Most Latin Americans knew less about us than the citizens of London, Paris, Rome. Now, at long last, we were neighbors. When President Roosevelt said he meant us to be *good* neighbors it meant infinitely more than it might have even a few years previously.

But don't think that Europe calmly folded up its Latin American air line ambitions in the face of the Yankee onslaught.

During 1929 France branched out from Buenos Aires to Asuncion, Paraguay; consolidated its trans-Andean service to Santiago, Chile; thrust a 1650 mile long line southward into Patagonia. In 1930 it opened 700 miles of route in Venezuela. A financial-politico scandal over French air line affairs later forced the abandonment of many of these extensions. But France held on to its Natal-Santiago service and began experimental flights across the South Atlantic to replace the dispatch-boat link. By 1936 these flights had been put on a weekly basis—bringing Marseilles within three days of Buenos Aires, legs in both Africa and South America being flown at night.

Germany, with large, influential blocks of its citizens living in South America, worked steadily on its Natal Buenos Aires service, finally extending it across the Andes to Chile. It reached the West Coast from Brazil by way of Bolivia. With the Graf Zeppelin, it set up an airship service to Brazil. In 1933 it began supplementing that service with a trans-Atlantic catapulted-flyingboat mail line between Natal to Bathurst, regular weekly crossings being set up in 1934. With the establishment of its present political regime, Germany's efforts redoubled. It had always used the "local-company" technique with considerable success. "Country X," for example might be convinced it needed such and such an air line but hesitated to let a foreign nation control it. But why delay? German interests would help organize such a service. Capital might be entirely local; so might many of the officials. Germany stood ready to furnish any number of planes, and provide all the personnel until citizens of Country X could be trained to take over. The result, of course, is perhaps even more effective than a completely "foreign" enterprise in furthering German interests. Such plans as this have been adopted or proposed in almost every South American country within the past few seasons.

And that isn't all. For years our position has benefitted immensely from the fact that Pan American's services were *complete*. That is, it could speed passengers as well as mail and express between the U.S. and Latin America, while French and German air liners (except the Graf Zeppelin) carried only mail across the South Atlantic. Now both Deutsche Lufthansa and Air France have announced they will start passenger service between Africa and Brazil during 1939; both planning to do so on a twice-weekly basis.

Moreover, Great Britain and Italy have surveyed routes to South America and plan to open services to that continent during the current year, closely following the routes used by Germany and France. Already they have arranged for extensions southward from Natal to Buenos Aires and entered the field for others. Holland, already intrenched on the North Coast of South America, proposes to cross the Atlantic via the Cape Verde islands.

Pan American, instead of facing two semi-effective rivals now faces five who will be very effective indeed.

The United States will have to redouble its efforts to hold its leadership. In the near future, our European rivals will, between them, have established a practically daily service across the South Atlantic to such key centers of Latin American population and commerce as Rio de Janeiro, Buenos Aires and Santiago.

ERWIN BALLUDER
Manager Western Division

D. G. RICHARDSON **(see page 29)**
Division Operations Manager

ROYAL D. SUNDELL
Division Engineer

CAPT. GEO. KRAIGHER
Division Chief Pilot

E. P. CRITCHLEY
Division Operations Manager

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Boeing 307 Stratoliner

. . . FASTEST SUPER BOMBERS
Boeing Flying Fortress

THE rapid development of 4-engine aircraft in the United States has marked a significant milestone in the world of aviation. In this new 4-engine era the name BOEING stands predominant.

The giant 74-passenger BOEING 314 Clippers have been awarded their Approved Type Certificate by the Civil Aeronautics Authority and the first ships of the Clipper fleet have been delivered to Pan American Airways. Designed with special emphasis on passenger comfort, long range operating efficiency and safety, these great flying boats are capable of spanning either the Atlantic or the Pacific with a commercially practical load of passengers and cargo.

Meanwhile the first of a fleet of BOEING 307 Stratoliners has completed with outstanding success its comprehensive schedule of preliminary flight tests. These planes, designed to capitalize on the advantages of high altitude flying with its attendant comfort, speed and safety, are another vital forward step in commercial air transportation.

The BOEING B-17-type Flying Fortresses in the service of the United States Army Air Corps have proved their capabilities by thousands of hours of flying in all varieties of weather and on all types of assignments. Their service record has unequivocally demonstrated the merits of 4-engine aircraft.

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THE CLIPPER
THE FLYING FORTRESS

Our own services must be stepped up in frequency, not necessarily to meet competitors on a flight-for-flight basis, but to keep the practical convenience of air transport to the United States on a par with that to Europe. As our domestic air lines have so well learned, the fastest planes in the world can't hold traffic in the face of competition offering markedly better convenience and frequency of schedules.

We must do every practical thing within our power, too, to increase the speed of our trunkline schedules. Much is already in hand in this regard. Plans are underway to extend the full trans-oceanic technique as developed in the Pacific—non-stop, high altitude crossings in big flying boats, at night—to trans-Caribbean operations. Thus can be eliminated one whole night's layover on the North Coast of South America. Thus an entire "business day" can be slashed off all schedules from that point southward.

Night flying over some of the coastal routes has also been long under study. There are political difficulties involved in securing permission to set up and operate the necessary ground equipment. The move will be extremely costly and one which Pan American Corp. can hardly face unaided. But already the Civil Aeronautics Authority is breaking the trail by setting up lights on our own Caribbean islands and ways may soon be found to extend such basic airway aid to other parts of the network.

A third line of attack lies through the sub-stratosphere. Few airline operations offer more advantages to be gained through the use of the pressure-cabin technique than this one. The ports of call are far enough apart to justify the investment of the time used for climb. The terrain, and the weather make low flying, especially at night, a thing of difficulty. Already Pan American has three Boeing 307 Stratoliners on order. One is well along on its flight tests. This Latin American network may well become the first air line in the World to be operated on a high-level basis.

Flight No. 269

(*Continued from page 25*)

air line must have practical two-way radio on every flight it dispatched. The fact that tropical static made radio phone range very limited, set Pan American off on its own intense development of aircraft code-type radio. The hot, moist climate made super-conscientious maintenance absolutely essential.

The march toward an ability to wreak air transport "conquest" on any ocean was thus fully under way eight years ago.

The same year Pan American again asked for proposals for a new type of over-water transport—one capable of: "a cruising range of 2,500 miles against 30-mile head winds . . . a crew of four together with at least 300 pounds of air mail . . . cruising speeds at 85 per cent of rated engine r.p.m. of 145 m.p.h."

As a result Sikorsky and Glenn L. Martin each began construction in 1932 of three big flyingboats. Both designers far exceeded the original specifications. Both planes, the Sikorsky S-42 at 42,000 pounds and the Martin-130 at 53,000 pounds gross weight, are still today the most efficient load carriers of their weight ever flown. When the first of each type was launched in 1934, they called forth floods of well-deserved praise.

The story of the next two years of the Pacific venture has been too well told in previous volumes of AVIATION to need more than a summary here: March 27, 1935 the steamer North Haven, loaded down with thousands of tons of unique cargo and carrying 118 air line technicians and construction men, sailed from San Francisco on a three months "colonizing" cruise that set up complete and working air bases at Hawaii, Midway, Wake and Guam and carried supplies through to Manila where another was soon started. April 16, the Sikorsky-built "Pan American Clipper" swept out to Honolulu on the first of four "survey" flights of increasing length that "flew in" the airway as far as Guam by October. On Nov. 22 the Martin-built "China Clipper" took off from California to open a mail service through to Manila. By the Winter's end it had been joined by its sisters, "Hawaii Clipper" and "Philippine Clipper." During the summer of 1935 schedules were set for regular weekly departures each Wednesday afternoon from Alameda on San Francisco Bay. In October, 1935 the service was opened to passengers. In February 1936 the route pushed through to reach Hong Kong and Macao on the China Coast.

What is more important than such a running history of the projects' development is to realize that, for all the five years of intensive preparations that preceded the opening of passenger service, this air line, thrusting boldly out across 9,000 miles of the World's biggest ocean, was still one of the boldest feats of pioneering ever attempted in this Technological Age.

A technique of operations, a body of trained men, a trio of airplanes—all representing great advances over any previous standards—took up the task. To say that the technique has remained unchanged in its basic features through the past three years does not mean that great labor has not been expended on it. Radio, navigation, weather systems have all been toilsomely refined to meet the unprecedented scale of their new applications. Combined they now permit Clippers to shift their courses hundreds of miles to "pick" their winds and weather. Long West-East flights set problems of take-offs or landings in the darkness and required development of elaborate lights to mark key harbour areas. The bases on lonely Midway and once-desert Wake have taken heavy toll in labor, to make them complete and habitable. No one knew how crews would stand up to the tasks the Pacific crossings set. Studies began of crew fatigue by flight, by month and by year.

From the start it was recognized that even larger ships would be needed before the crossing could be made be-

FOR FLYING DOWN TO RIO? Pan American will use its Boeing "Stratoliners" a bit over the Atlantic; a lot over Latin America—another "first" for Yankee flying.

Pan American Specified

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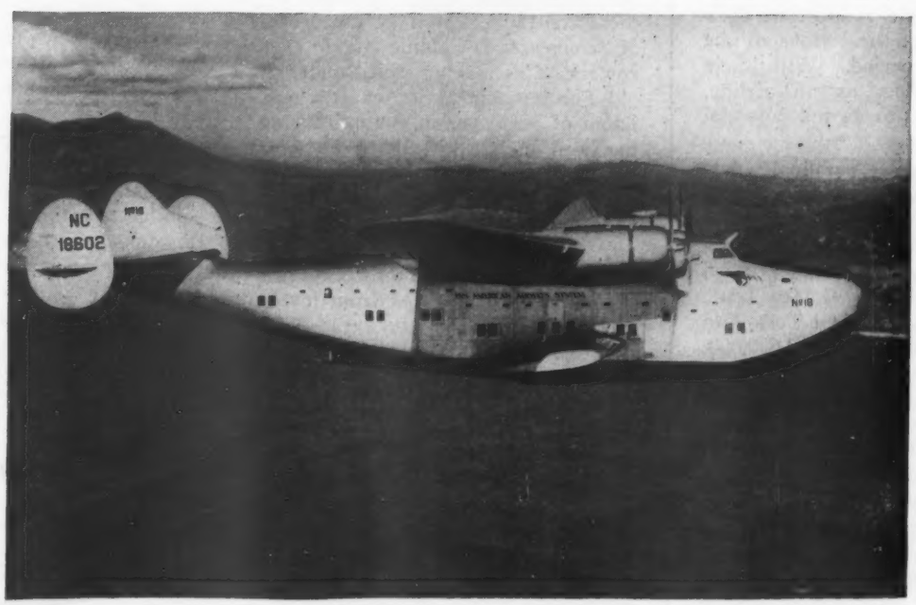

Not only Boeing and Pan American, but plane builders, operators and exhaust manifold makers throughout the entire aircraft industry put their O.K. on Inconel*. Good for thousands of hours of trouble-free operation, Inconel resists heat and corrosion, and so retains its toughness and strength. For planes, large and small, it is a *proven* manifold metal.

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*"Inconel" is a registered trade-mark of The International Nickel Company, Inc., which is applied to a nickel alloy containing approximately 80% nickel, with additions of chromium and iron.

tween California and Hawaii (2461 miles) with commercially practical payloads. By 1936 it was apparent that enough progress had been made in plane design to justify the ordering of six new 82,500 pound super Clippers from Boeing. Meanwhile P.A.A. carried on with three then (after the loss of the Hawaii Clipper) with only two of the Martin-built Clippers. Over any other leg of the Pacific crossing, or on the distances involved in a flight between Hawaii and New Zealand or Australia, these ships could render unlimited service. But carrying the huge fuel supplies and reserves needed on the long key leg they can take an average of but ten passengers after mail and express quotas are accommodated.

The new Boeings will enlarge that bottle neck. With full mail and express cargoes they will carry more than 30 passengers in palatial berths on the overnight crossing to Hawaii. Their huge fuel capacity makes higher cruising speeds generally possible. The layout and the comfort of their flight decks reflect the lessons of the long pioneering period. With their arrival, the airline, as an airline, comes at long last to its full potential powers.

Which brings us to our final point-of-view—how has this airline fared as a business enterprise? The answer is, to put it briefly, "Terrible." Before the China Clipper first roared westward through the Golden Gate, the "Pacific project" had cost Pan American Airways some $3,600,000. Last month as the airline laid its application before the Civil Aeronautics Authority, its books showed losses in the Pacific of $475,000 during 1937, losses during the first half of 1938 of $370,000; current losses (with only two Clippers in service) of $95,000 per month.

What had happened? On page 22 we set forth the general paths of the answer. Shipping charges on all materials to the Mid-Pacific are almost out of sight. The company had to set up its own airbases, its own radio, and to a large extent its own weather system. The initial cost in this case was huge; the cost of upkeep very high indeed. It had to develop a fleet of the world's most expensive transport planes. The low frequency of service set its airplane employee and investment costs per mile of flying at new record levels.

Moral: There are some vital trans-oceanic routes where the old legal maximum mail rate of $2 per mile simply is not enough to bring income and costs into adjustment.

(*Continued from page 18*)

America; bridges the Pacific; gives a new tempo to travel in China and Alaska. Tomorrow it promises us a new leadership on the North Atlantic.

Unlike Europe's heavily subsidized, government-directed air trusts with which our international air transport must compete, Pan American Airways is a private commercial enterprise. Its entire capital has come from private U.S. citizens and commercial organizations who have contributed an impressive $20,500,000 toward the establishment and operation of an international air transport service for the United States. Its measure of government aid has come entirely from revenue derived from contracts for the transportation of U.S. mails over certain of its main trunk air lines. And these contracts it won by the process of competitive bidding against all comers. This revenue, fixed under the old Foreign Air Mail Act at a maximum of $2.00 per mile (and averaging well under this figure in actual payments) is not however borne entirely by the U.S. government. The Post Office, of course, gets a big direct return from postage. Also Pan American pays back to the U.S. Treasury all moneys received from foreign governments for the return transportation of mails to the United States. In estimating actual costs of foreign air mail service to the U.S. then, one must subtract the difference between gross payments to the Company, and these returns to the government—(about 49% for the year 1938). With this, Pan American has established rights for, surveyed, built and equipped its own airways, developed its flight equipment, trained its personnel, prepared itself for greater and greater tasks ahead. The total payments received from the United States would not meet Pan American's personnel payroll.

Of a total income of $14,730,000 reported by Pan American for 1937, an approximate $8,000,000 came from the U.S. government; $6,730,000 coming from the transport of passengers and express and from other activities. Since this income exceeded expenditures by $510,416, Pan American that year earned a modest 2.5 per cent on its investment.

The picture presented by international air transport in Europe differs sharply. Almost without exception each nation has itself taken the initiative in combining all its potential international air carriers into one official national air line monopoly. In many cases heavy governmental subscriptions have been made to the capitals of such companies. Governments have retained large shares of control over company affairs. In some cases, such control is complete in every detail.

Liberal direct subsidies are guaranteed over long term periods and are adjusted frequently, if the companies cannot show a profit. Contracts for mail carrying call for payments to the air line over and above this direct aid. Almost invariably, any amounts paid by outside nations for the transport of return mail are retained by the carriers. On top of all this, colonies or dominions, states or even cities served by the national company often make liberal additions to the federal payments. Weather and communication service costs are carried by the governments. So also, in most cases, are the big items required for developing new planes, for making survey flights of new routes, for conducting negotiations for new routes and facilities.

Under such circumstances, total governmental expenditures for international air transport are almost impossible to estimate and compare. But this much is certain: The United States is represented on the World's aerial trade route map by almost twice as many miles of line as its nearest competitor. Its top-flight planes do almost twice the flying. Yet the net cost of this priceless asset to the U.S. government is less than half that underwritten annually by any of its four or five leading competitors.

2. Imperial Airways

IMPERIAL AIRWAYS, LTD., was formed in 1924 at strong governmental behest by four pioneer British companies operating trans-Channel services.

Last summer the British Government announced plans whereby the Continental routes were to be turned over to British Airways, who were also to project a South American

route, and the long Empire routes to Africa, Hongkong, and Australia were to be left with Imperial. More recently the Air Ministry has planned the consolidation of both Imperial and British Airways into a public corporation through the expedient of issuing a fixed dividend stock, guaranteed by the government. Thus after years of experiment, England has finally seen fit to follow in the footsteps of other European countries by grouping all its foreign routes under one unified company operating under close governmental supervision.

Last year Imperial Airways undertook two major changes in operating policies. The first was a change of all the Empire routes from land plane operations to seaplane, using the new Short Empire flying boats. The second great change was putting into operation the new Empire Mail Plan. This meant the carrying of all first class mail up to one-half ounce by air to any point on the Empire routes with no additional surcharge.

Profit for the year ending March 31, 1938, was 97,267 pounds against 164,755 pounds previously. A 7 per cent dividend on 1,620,000 pounds capital was declared against 7 per cent plus 2 per cent extra for the year before.

3. Deutsche Lufthansa

TRIAL FLIGHTS were started in 1928 to Africa with the idea of a link across the South Atlantic with the lines of Condor Syndicate. For a period in 1930 mails were flown to the Canary Islands and transferred to steamers of the Hamburg-American Line, then picked up by planes of the Condor Syndicate at Fernando de Noronha off the Brazilian coast. This service was continued in 1931 being supplemented by the Graf Zeppelin's many round trips between Germany and Brazil.

By 1932 preparations were underway for an all-air service to South America. The freighter Westfalen was converted into a seaplane mother ship; during 1933 its catapult and landing apron were tested in the Baltic Sea. Dornier built a special model of the Wal for the service. Late in the same year the Westfalen was stationed half way between Africa and Brazil. Sixteen flights were made between the two continents. New high performance Heinkel and Junkers monoplanes on the Germany-Africa section completed this high speed mail service between Buenos Aires and Berlin.

A passenger and mail line was opened during the spring of 1938 to the Far East via Syria, Iraq, Iran, Afganistan as far as Kabul. One trip per week was scheduled for the South Atlantic; the pool agreement with Air France, by which this route is operated, still has several years to go.

First survey flights of the North Atlantic were made in 1936. Seven round trips followed in 1937. Then during the summer of 1938 14 such flights were made with two catapult surface vessels operating.

4. Air France

AIR FRANCE was formed in 1933 as a result of a merger of all French air line activities. The four companies involved in the merger were Air Union, Air Orient, International Air Navigation Company (Cidna), and General Air Transport Company. Aeropostale was still undergoing liquidation and was not included until later. The company was capitalized at 120,000,000 francs, one-third of which was held by the French Government. Currently Air France receives 182,550,000 francs from the Government, 14,265,000 francs from the Colonies, and 57,720,000 francs mail pay. This amounts to about $9,000,000 for 6,242,236 miles flown over 24,842 miles of route. In 1937 Air France was able to show a profit of nearly 5 million francs and paid a dividend of 4%.

All-air mail crossings of the South Atlantic were begun in 1936. The years between 1929 and 1931 saw much expansion in South America, but in the latter year a politico-financial scandal affected the air line, and the extensions were abandoned until only the main trunk between Natal and Santiago remained.

South Atlantic passenger flights are scheduled to open in 1939 using Loire-et-Olivier H 47 flying boats. The line from Marseilles to Saigon, which was opened by Air Orient in 1931, has in recent months been extended through to Hong Kong. On the North Atlantic Air France made a successful survey flight late in August, 1938, with a Latécoere flying boat. New and much larger equipment is planned for North Atlantic use.

5. Royal Dutch Airlines

THE ROYAL DUTCH AIRLINES (whose proper name, Koninklijke Luchtvaart Maatschappij voor Nederland en Kolonien N. V., furnishes the initials K.L.M. by which it is best known) was organized in 1920 by its present director, Albert Plesman. A user of Douglas and Lockheed equipment, K.L.M. is by far the most "Americanized" air line in Europe.—Continental routes touch most of the principal cities of Europe. A semi-weekly service to Batavia was opened in September, 1930. This service has been gradually increased until it became three times a week in 1938. Excellent relations have been maintained along the Asiatic route with Air France and Imperial Airways. Monthly conferences have been held, rates have been equalized, and schedules adjusted to prevent conflicting departures wherever possible.

Recently K.L.M. has been granted concessions into Trinidad and Barbados, in exchange for reciprocal rights to the British in Dutch West Indies. Survey flights were started last October and service was started over this route early this year. Landing permits have been received from Portugal for a South Atlantic route from Amsterdam via Lisbon, Cape Verde Islands, and Paramaribo to Curacao.

It is planned in 1940 or '41 to change the Amsterdam-Batavia route to go via Leipzig, Germany; Basra, Iraq; and Colombo, Ceylon. Once that is accomplished K.L.M.'s long projected 2½ day service to the East Indies will be a fact.

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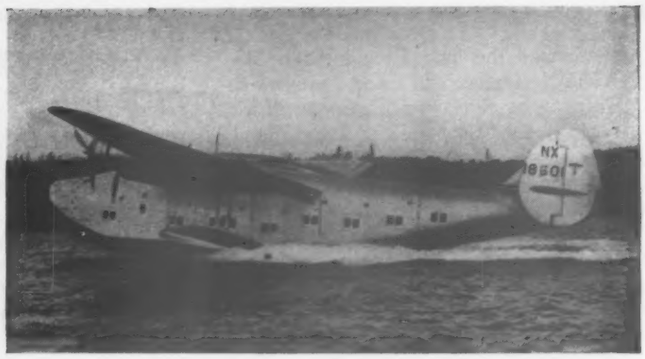

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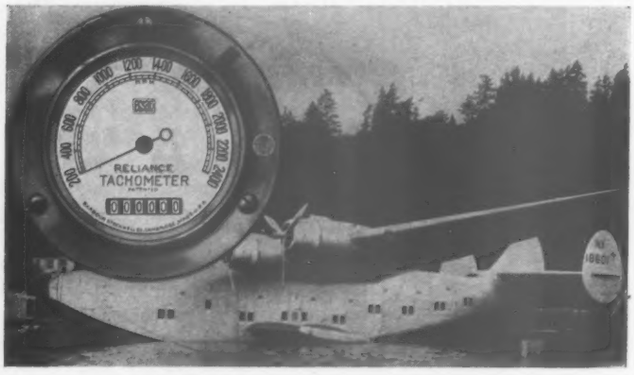

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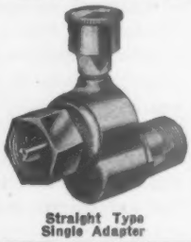
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Weick and Morehouse collaborate on a new type for large production at small cost

Above: Closeup of the Erco Model 310 developed by Fred E. Weick, showing the tricycle landing gear and nose cowling. Below: the ship in landing position. Note the unusual tail for a single engined ship.

SEVERAL TIMES during the past year Fred Weick has taken us out to College Park to see his new "baby." Engineering and Research Corporation's Model 310. We followed its career with great interest as it took shape in the shop and got a great kick out of watching it perform in the air several months back.

Although further details are promised when the ship receives its ATC and goes into production, the preliminaries which have just been released are interesting, for many of the ideas embodied in the new machine stem from the work that Weick did with the W-1 (see AVIATION January, 1936) when he was a member of the staff of National Advisory Committee.

No surprise therefore (knowing Fred Weick) that the new machine should be on a tricycle type landing gear and should incorporate simplified flying controls. A linkage interconnects the ailerons and the rudders, which permits the airplane being flown entirely by wheel control. Furthermore, the ship has been designed to prevent the pilot holding the wing in a stalled attitude, power on or power off. The tail surfaces have been arranged so that the airplane will not balance in a spin. As a matter of fact, Weick told us that several expert pilots had attempted to spin the experimental model but that none had succeeded.

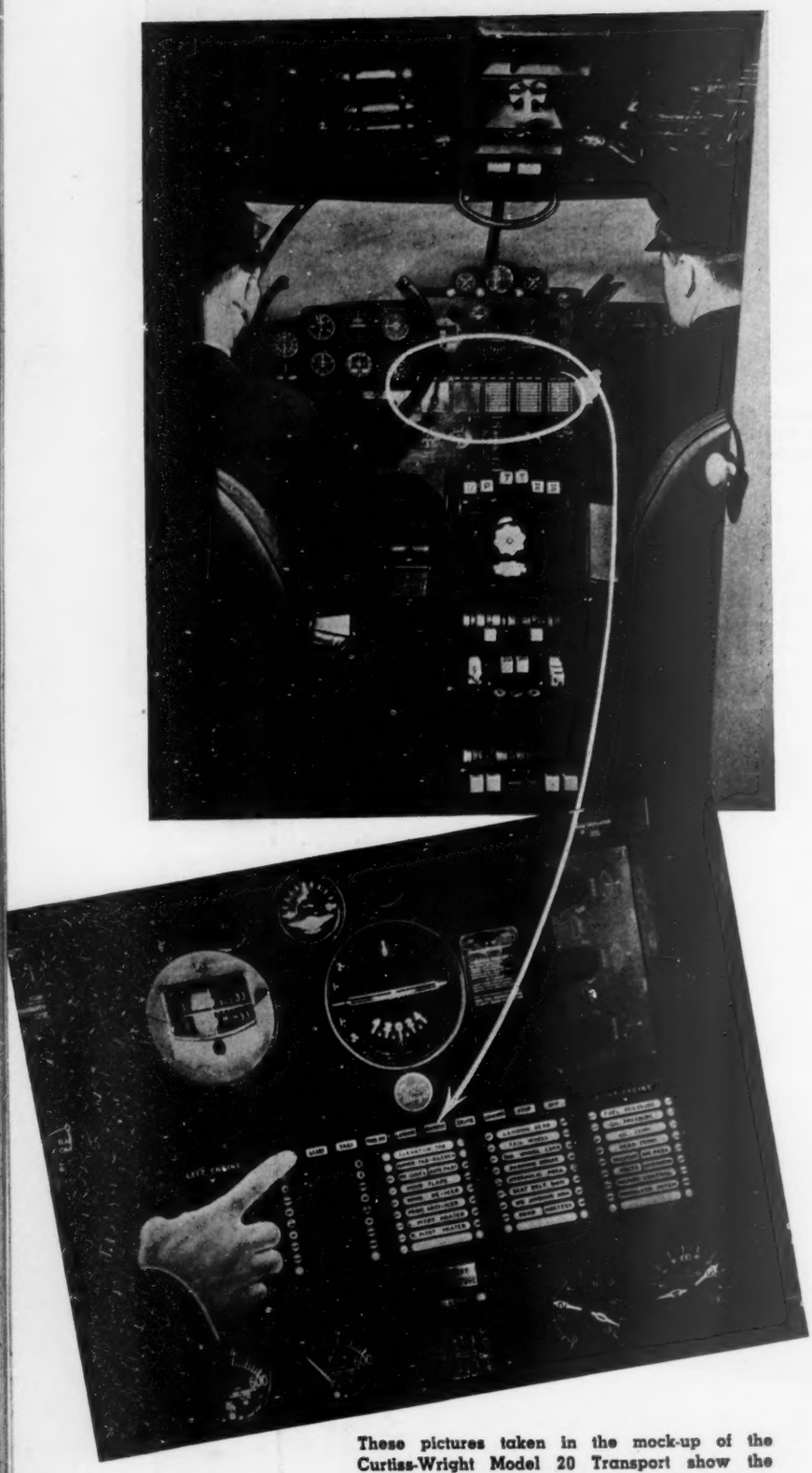
Airplane characteristics as furnished by the manufacturer include: span, 30 ft.; length, 18 ft. 6 in.; height, 5 ft. 4 in.; wing area (including aileron), 140 sq. ft.; weight empty, 650 lb.; gross weight, 1100 lb.; wing loading, 7.8 lb. per sq. ft.; power loading, 19.9 lb. per horsepower. Performance (with standard equipment): maximum speed, 101 m.p.h.; cruising speed, 90 m.p.h. Equipment includes: Sensenich propeller; Lord rubber engine mounts; Hayes wheels; Goodrich brakes and tires; ERCO shock absorbers.

The airplane is fitted by a 4-cylinder inverted in line air-cooled engine designed by Harold E. Morehouse and built by Engineering & Research Corp. It is rated at 55 hp., at 3,000 r.p.m., at sea level, with 60 hp. at 3,750 r.p.m. available for take-off. The compression ratio is 5.75 to 1. The engine is designed to operate on 72 octane fuel. The bore is 3¼ in., the stroke 3½ in. giving a displacement of 116.14 cu. in. Outside dimensions: 34⅞ in. long; 20⅞ in. high; 16⅝ in. wide. Dry weight (without propeller hub), 155 lb. including dual Scintilla magneto ignition, carburetor, exhaust port flanges and Lord rubber-mounted units. Specific weight at sea level is 2.58 lb. per horsepower. Fuel consumption at rated horsepower is .56 lb. per brake horsepower per hour, oil at .012 lb. per brake horsepower per hour.

TELL TALE

With the flying of transport airplanes getting no simpler, any move to reduce the chances of pilot error is a step in the right direction. A new device for this purpose is herein described.

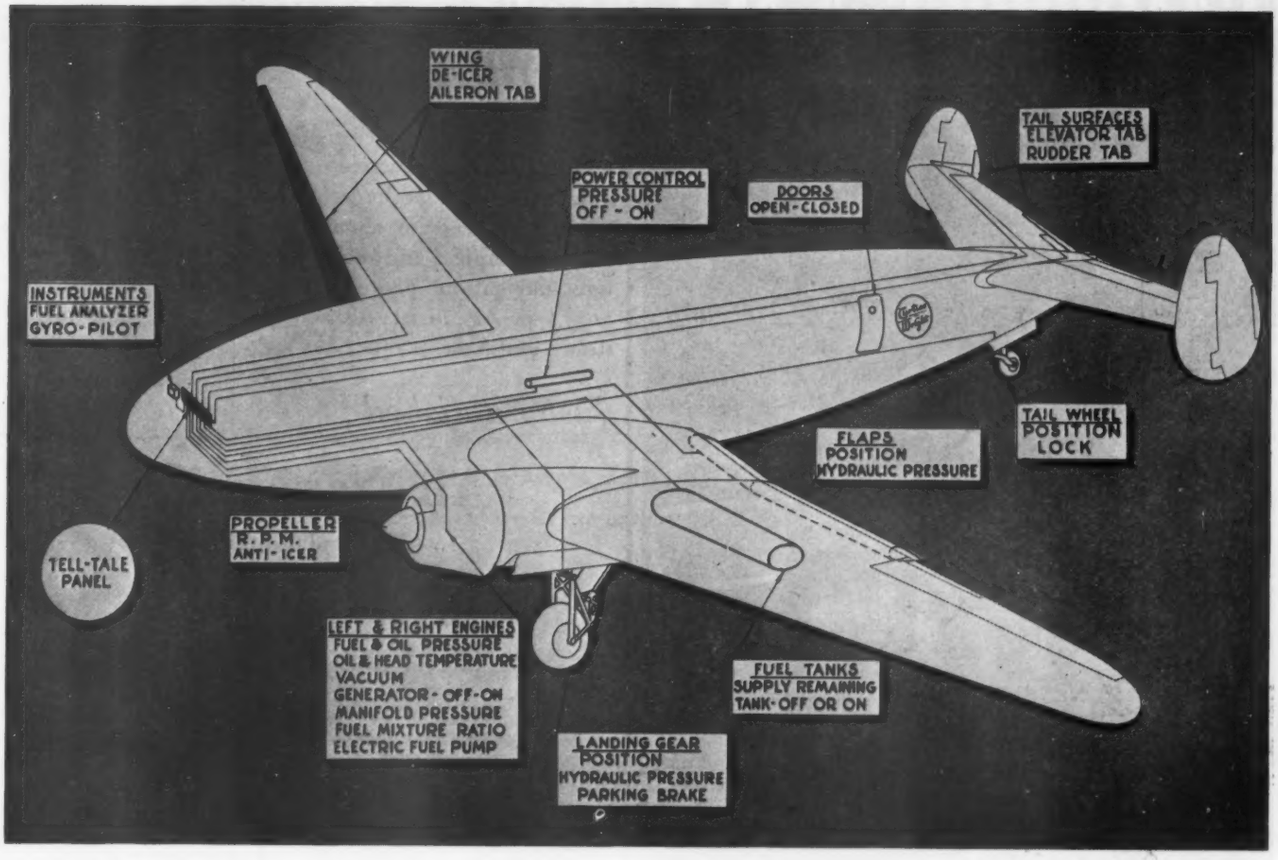
By T. P. Wright
Vice-President and Director of Engineering, Curtiss-Wright Corporation.



These pictures taken in the mock-up of the Curtiss-Wright Model 20 Transport show the relation of the "Tell-Tale" to the pilots and to the other instruments

AN IMPORTANT general principle applicable to air transportation and for sometime past recognized by other industries engaged in serving the public, is this: "In an industry rapidly advancing both in practice and in scientific research, the less left to chance and whim, the better. The process is one of reducing complications for users at the price of increasing complications of engineering." The development of transport airplanes has resulted in more and more complications of controls and multiplication of instruments. Flying operations may be justifiably carried on under more and more severe weather conditions as the art progresses. Accompanying such extension of service however, there must be improvements which will result in far greater safety.

In "AVIATION" for August 1938, a description of the Curtiss-Wright Model 20 Transport was presented, stressing particularly those features, the aim of which was to enhance safety. Among the devices described was a "specially designed 'Tell-Tale' instrument panel which relieves the pilot of constant instrument check during a given flight regime or when changing to another regime." Analysis of the causes of accidents of the past shows that they have, in substantial proportion, been brought about by "pilot error" or by adverse weather conditions in which faulty pilot judgment may have contributed. It is therefore, the definite responsibility of the airplane manufacturer to improve the pilot's workshop and



so to relieve him of unnecessary duties as to lessen fatigue and therefore, "pilot error."

The operation of a modern transport airplane is necessarily governed by a great many instruments and controls, well over one hundred in number. Most of the instruments give vital information as to the immediate condition of the powerplant system, the electrical and hydraulic systems, and others showing whether operation is in the prescribed range; and *if observed in time,* give warning of improper functioning or impending failure. In addition, the various controls must all have a very definite setting which changes for each flight regime: For example, the proper position of a given control for cruising operation may be incorrect when making an approach for a landing. It is humanly impossible to observe all instruments and control settings at one time and an increase in the number of operating personnel is not complete and reliable assurance that important warnings will be seen in time. In bad weather operation, it becomes particularly difficult to pay careful attention to all such details.

Recent physiological studies have emphasized the importance to safety of reducing pilot fatigue. The fundamental duty of the pilot should be navigation, involving flight instruments and radio contact, as well as actual flying. If there is constant worry regarding proper functioning and proper positioning of controls, nervous strain will result. The automatic pilot has performed valuable service in relieving the pilot but there is a great need also present for offering almost instantaneous check on the functioning of all instruments and controls of the airplane.

In flying, the time element is all important and anything that saves time for the pilot is vital. At the top speed of the Curtiss-Wright Model 20 three hundred and thirty-eight feet of distance are covered each second. Much can happen in that distance. A device which will save many seconds, perhaps minutes, is therefore of outstanding importance from the standpoint of safety. It represents a fourth pilot in the division of labor of the many duties performed by the pilot, co-pilot, and gyropilot.

The Curtiss-Wright "Tell-Tale" device makes possible, in a very simple manner, an immediate check on forty-seven details. Without this device it has heretofore been necessary for the pilot, for each detail; first, to find its location, and then to adjust his mental processes to interpret its reading. As shown in the accompanying simplified diagram, the instruments and controls are electrically connected to a panel on the instrument board of the airplane. The two major functions served by this "Tell-Tale" panel are a warning of malfunctioning of instruments and an indication of the setting of controls.

Let us now see in more detail just how the "Tell-Tale" indicating system works. The centrally located panel is shown on the accompanying instrument board photographs and consists, broadly speaking, of two parts; the first will indicate by signal lights whether or not instruments that should operate within a prescribed range for each condition of flight are within that range; while the second part will indicate proper functioning or positioning of controls which vary in operation or setting with different flight

(*Turn to page 87*)

CAMBRIDGE A. M. I. on the BOEING 314

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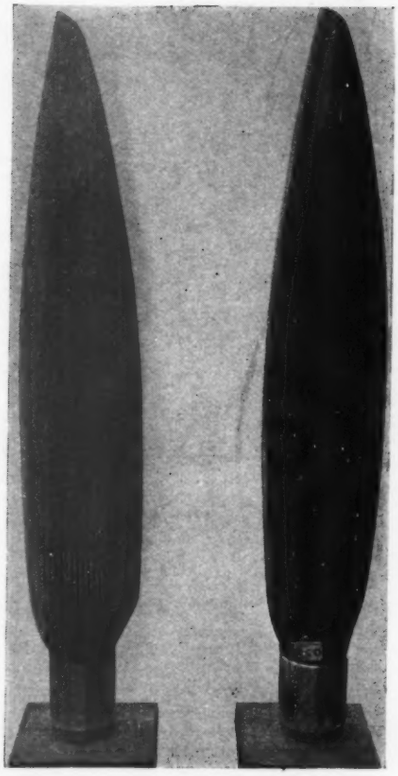
WOODEN BLADES for Controllable Props

For two years Henry Berliner and Fred Weick have been experimenting with the Schwarz composite wood and plastic blades. Now they are in production in a new plant.



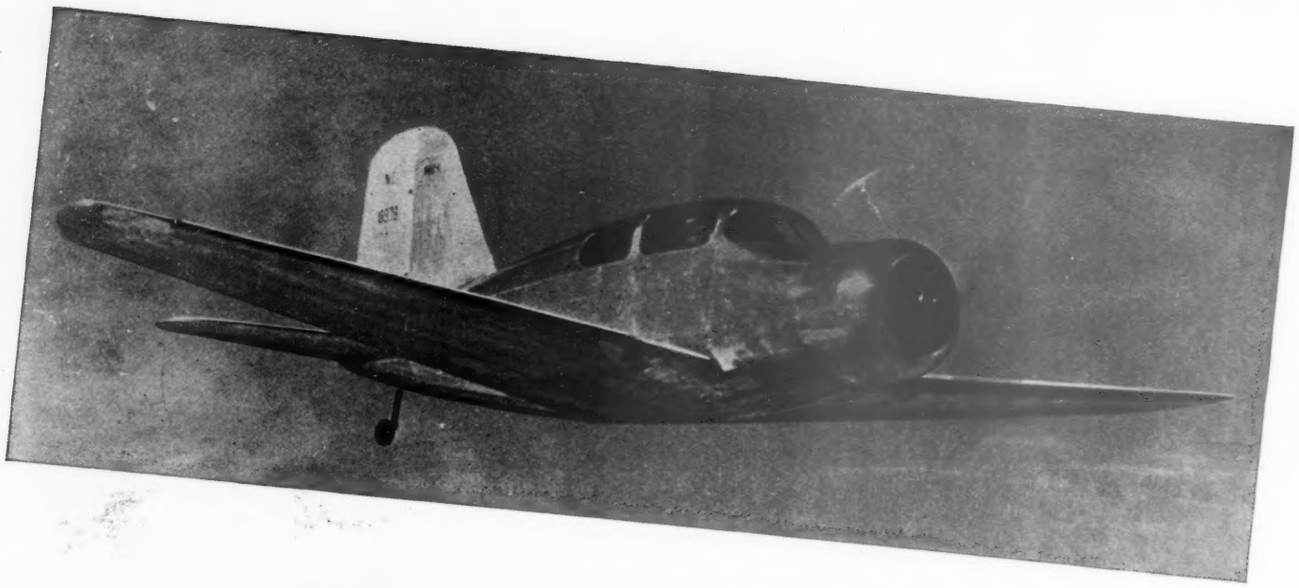
Finished and unfinished blades. Note plastic laminations solid at hub and feathering into solid laminated spruce structure of the blade proper.

IN AN EFFORT to make available in the United States propeller blades having light weight, and other desirable characteristics, the Engineering and Research Corporation of Washington, D. C., has obtained the license to manufacture in the United States the composite wood and plastic propeller blades originally developed by the Schwarz Company in Germany. Extensive experimental work has been conducted over a period of nearly two years under the direction of Fred E. Weick, well known propeller expert, and with the aid of orders from the Army and Navy Air services. About forty experimental wood and plastic propeller blades have now been made by the Engineering and Research Corporation, with diameters of propellers ranging from 6 to 16 feet. An ATC has been obtained on an 8 ft. diameter adjustable pitch propeller rated at 300 h.p. and weighing 41.5 lbs. A new plant has just been erected in Riverdale, Maryland, and commercial production of this type propeller blade is now under way, although further experimental work will be continued indefinitely. In general the Schwarz type propeller blade is built up of laminated spruce or other light woods, protected by a tough weatherproof plastic covering and terminating at the root in a cylindrical steel sleeve or ferrule which can be mounted in bearings in a controllable hub. The laminated wood of the blade merges into a root of impregnated and compressed hard wood called compreg, which is threaded and screwed into the ferrule.

Two blades of the Schwarz type.

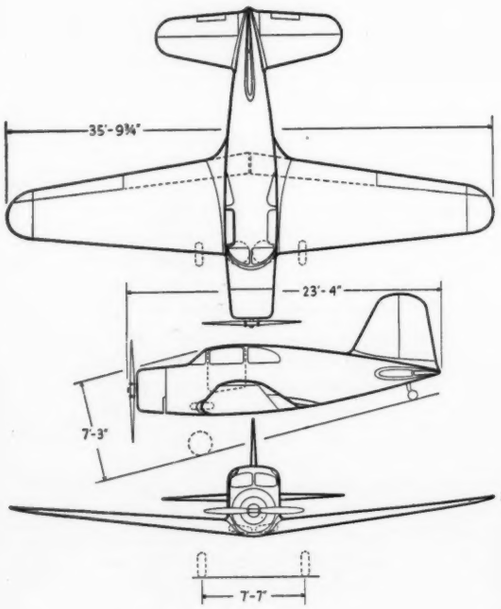
The leading edge protection on the Schwarz type blade consists of a long, narrow strip of metal of relatively heavy gauge which is soldered to a wider piece of wire mesh which is in turn tacked to the blade and then buried in the plastic cellulose acetate material with which the blade is then covered. The finished propeller has a perfectly smooth leading edge and blade surface, as the cellulose acetate is flush with the metal strip. Thin tip blades may be provided for high tip speeds through covering the outer portion of the blade with a fine woven steel wire cloth reinforcing imbedded in the plastic covering.

While the greatest advantage of these composite wood and plastic blades is probably their light weight (ordinary solid duralumin blades being about fifty per cent heavier) they have other attractive features, such as the ability to damp out vibrations, freedom from fatigue difficulties, and the ease and low cost with which new or experimental designs can be constructed.



HARLOW PJC-1

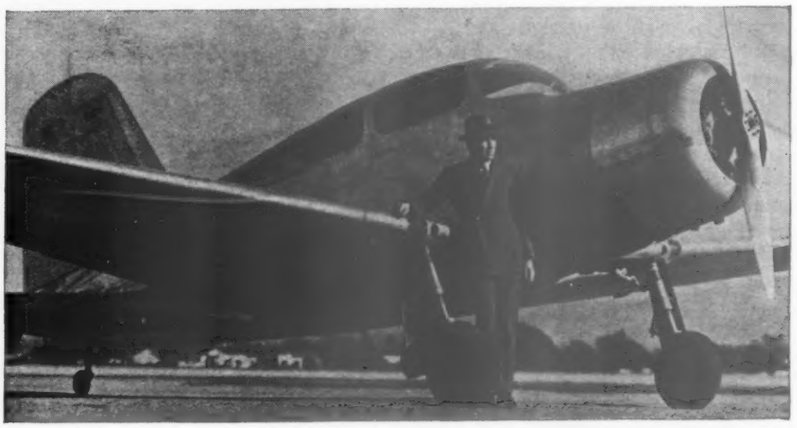
An all-metal machine with transport features designed for the private owner field.



AFTER MORE THAN THREE YEARS of development work, and fourteen months of flight testing, the new Harlow Private Transport makes its bow to the field of private-owner aircraft. It carries ATC No. 659 and a base price tag under $7,000.

The present plane is licensed as a two place plane, but the production airplane will be of four place type. A large door on the right side of the fuselage provides easy access to the cabin interior from a walkway along the wing root. The cabin is completely upholstered, sound-proofed, ventilated and heated. Wide vision is provided by generous windows.

Extensive flight testing has been conducted on the machine. A 145 h.p. Warner Super Scarab engine provides a claimed top speed of 170 mph and a cruising speed of 160 mph at optimum altitude. Its landing speed is put at 48 mph with the split flaps fully ex-



John C. Kelly, Jr. is vice president in charge of Sales for the Harlow Engineering Corp. He has been active in airplane distribution for a number of years.

Flying Equipment

tended to their maximum deflection of 45 deg. Rate of climb is 900 feet per minute and service ceiling 13,400 ft. Cruising range is 600 miles. The plane is reported to be extremely maneuverable, stable to a high degree, and easily controllable even in the stalled condition.

In structure the Harlow features a continuous wing, with removable tips for servicing. Such a structure simplifies manufacture and maintenance, and avoids concentrated loads at fittings. The electrically operated landing gear retracts completely into the wing in six seconds and may be extended in six seconds. The action is positive and the gear locks on dead center in both up and down positions. Manual operation of the gear is provided in event of failure of the electrical system. Oleo hydraulic shock struts handle landings and taxing. Tires are of semi-low pressure type of 21 in. diameter. Hydraulically operated disc type brakes are standard equipment. The streamlined tail wheel is either steerable or lockable, and turns through 360 deg. The electrically operated flaps may be stopped in any desired position.

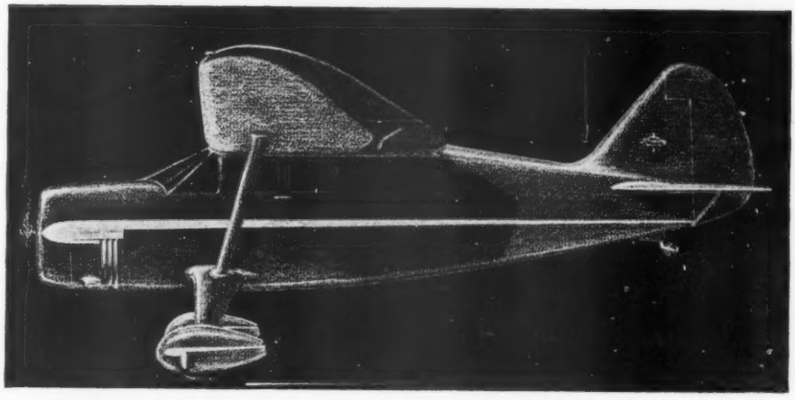
Standard cabin equipment includes dual wheel control, arm rests, dome light, assist grips, ash trays, glove compartment, map pocket and cigar lighter. Seats and seat backs, cabin and walls are upholstered in Pullman cloth. Instrument panel and window moldings are finished in harmonizing tones. Standard instrument equipment includes: compass, tachometer, airspeed indicator, rate of climb, bank and turn indicator, oil temperature, oil pressure, and fuel pressure gauges. The instrument panel is mounted on rubber and is indirectly lighted. A large luggage compartment is located aft of the rear seat, is accessible from the outside, and provides ample space for suitcases, golf bags, brief case, etc. Cabin ventilation is accomplished by means of ducts which bring fresh air from the leading edge of the wing, away from the engine compartment. An exhaust heater warms the air in cold weather, the volume of air, and temperature being controlled from the instrument panel.

Designer and general manager of Harlow Engineering Corp., is Max Harlow, formerly associated with the Hughes Aircraft Company. Harlow also served as a consulting engineer for the Lockheed Brothers Aircraft Co. in 1931, as designer and stress analyst for the Northrop Corp. in 1934, and as stress analyst with Douglas in 1934 and 1935. President is J. B. Alexander, veteran western aviation executive, former sales manager for Ryan Aeronautical Co., and also associated with Howard Hughes in filming "Hell's Angels." John C. "Jack" Kelley, Jr., is vice-president in charge of sales. Kelley is widely known as a pilot, and for his work as general sales manager for Stinson over a period of six years. Also associated are W. P. White, and H. F. Keenan, Los Angeles financiers.

Specifications and performance figures supplied by the manufacturer are as follows:

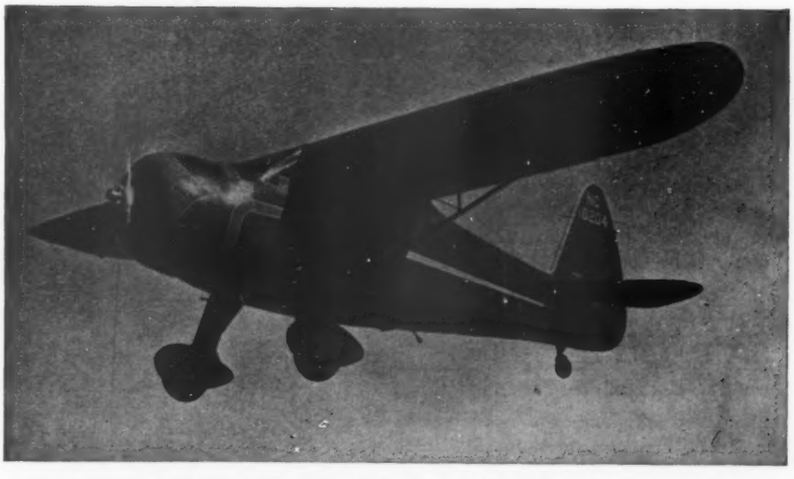
Span	35 ft. 9 in.
Length	23 ft. 2 in.
Height	7 ft. 6 in.
Empty weight	1531 lb.
Gross weight	2600 lb.
Useful load	1069 lb.
Engine	Warner Super Scarab 145 h.p.—73 Octane fuel.
Fuel capacity	35 gal.
Oil capacity	4 gal.
Starter	Eclipse electric.
Performance:	
Top Speed	170 mph.
Cruising speed	160 mph.
Landing speed	48 mph.
Cruising range	600 mph (at optimum altitude).
Landing run	240 ft., with flaps.
Climb	900 ft. per minute.
Service ceiling	13,400 ft.

New STINSON RELIANT



The 1939 Stinson Reliant, in addition to other improvements, boasts a completely re-styled exterior, interior, and carefully grouped instrument panel. Besides power plants previously available, it comes with the new 290 h.p. and 300 h.p. Lycoming, or 450 h.p. Wright engines. Cabin entrance doors and baggage compartment door are of the flush metal type.

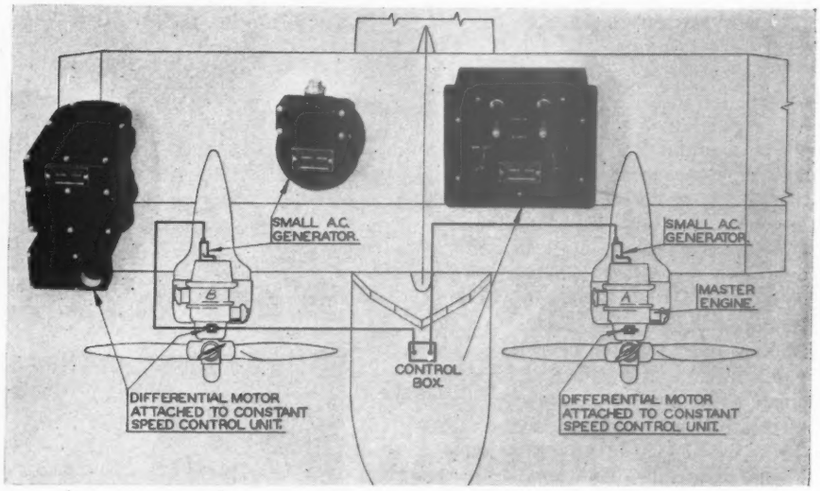
HOWARDS for 1939



Many improvements are found in the Howard line for 1939. Chief among them is a change in cowling design providing smaller diameter and greater accessibility. The front quarter glass has been lowered and the instrument panel moved forward to improve visibility. Oleo shock absorber action has been improved and flap operation has been changed from manual to electric. Seats also have been improved. Jacobs, Wright, and Pratt & Whitney powered models are available.

Automatic Prop Synchronizer

Hamilton Standard Device Synchronizes Engines by adjustment of propeller pitch


SMALL A.C. GENERATOR
SMALL A.C. GENERATOR
MASTER ENGINE
CONTROL BOX
DIFFERENTIAL MOTOR ATTACHED TO CONSTANT SPEED CONTROL UNIT
DIFFERENTIAL MOTOR ATTACHED TO CONSTANT SPEED CONTROL UNIT

Component parts of the Automatic Synchronizer. Engine A is the master engine and its generator supplies current to one winding of the differential motor controlling the speed of engine B. Current for the other winding of B's differential motor comes from B's generator. Changes in the frequencies of the two windings cause the motor to rotate which changes the propeller pitch until the engine speeds are equalized

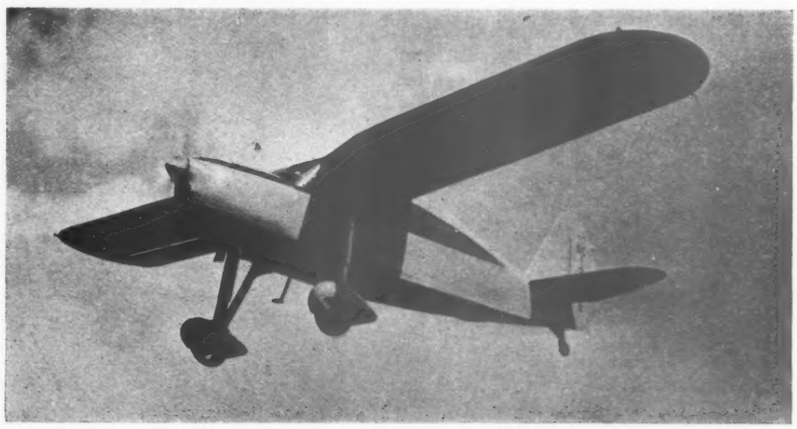
A NEW APPROACH to the problem of synchronizing engines is embodied in the Automatic Propeller Synchronizer offered after three years of development by Hamilton Standard. Propeller pitches are changed by differential three phase motors acting through worm racks to change the tension of the constant speed control spring. Each engine drives a small generator. The generator of the master engine supplies power to the one winding of each differential motor. The other winding is fed by the generator of the particular engine to be synchronized. Any difference in frequencies between the windings of any differential motor causes it to rotate changing the propeller pitch and therefore the engine speed. Thus the speeds of all engines are equalized with that of the master engine. As the speed of a differential motor is directly proportional to the difference in frequencies of its windings the approach to the synchronized condition is gradual and there is no tendency to "hunt."

Manual adjustment of engine speeds is made by switching off the synchronizer and operating a toggle switch for each engine. Tripping the switches, which are on the control box in the cockpit, to either "faster" or "slower" position permits current to flow from the generator to one of the windings of the differential motor. It then runs as an induction motor and operates the propeller control, changing the engine speed. When the synchronizer is in automatic operation the speeds of all engines may be changed by operating the toggle switch for the master engine. As its speed is changed the others follow. The master engine toggle switch is the only one that can be operated when the synchronizer is in automatic operation.

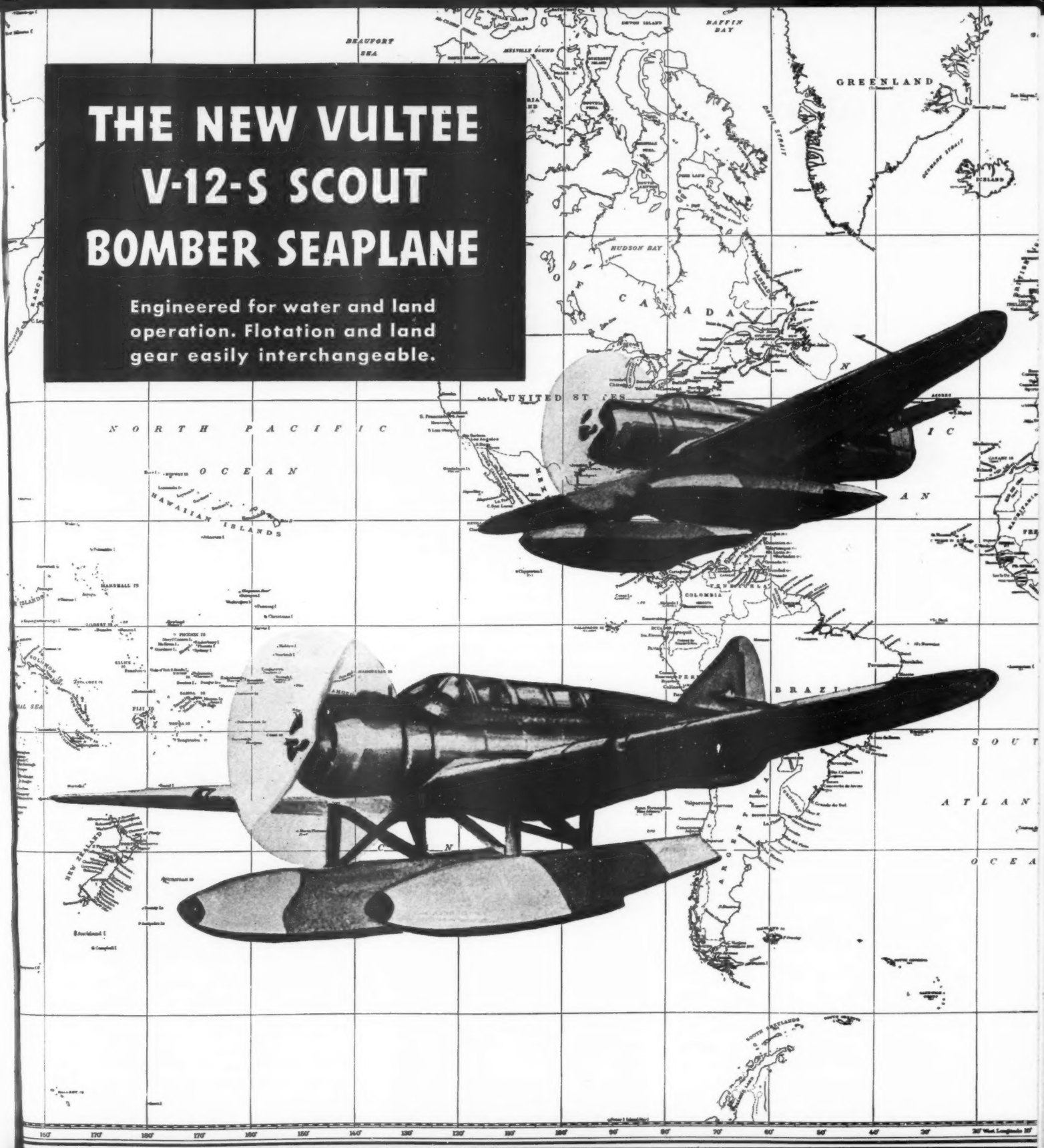
Each differential motor is equipped with two adjustable limit switches which operate when either maximum or minimum r.p.m. of the engine is reached. These shut off the motor and operate a clutch and brake which disconnect the motor from the worm rack and stops the propeller control from further movement. A small signal light for each motor is located on the control box to notify the pilot when the extreme propeller pitch position is reached.

The federal government and one airline soon will make test installations of the new synchronizer which was first demonstrated on United Aircraft's twin-engined Boeing transport.

New Fairchild 24's



No changes in aerodynamic design have been made in the 1939 models but a number of detail refinements without price increases are noted. Among them are: hydraulic brakes, improved oleo struts, steerable tail wheel, provision for airwheels, Plexiglas or safety glass windows, improved instrument panel, recontoured seats, ventilator, and redesigned engine mount and cowling for the Ranger models.



THE NEW VULTEE V-12-S SCOUT BOMBER SEAPLANE

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AVIATION

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Dialing the Air Waves with Don Fink

New Power for Ultra-Highs

Hundreds of watts at wavelengths below one meter give additional impetus to blind-landing development

THE "KLYSTRON", which generates hundreds of watts at wavelengths as short as 10 centimeters, is to have its first trial in connection with the system of blind landing originated by Irving Metcalf, Senior Aeronautical Engineer, in the Civil Aeronautics Authority and which has been developed at the Massachusetts Institute of Technology with C.A.A. funds.

When the Federal Communications Commission assigned radio frequencies as high as 125 Mc. specifically to aircraft service, its members acknowledged the fact that aircraft radio engineers have for years been seeking higher and higher frequencies with which to develop communication and navigation aids. Now, less than two years after the FCC assignments, the cry is for frequencies not in the hundreds of megacycles but in the thousands of megacycles, that is, wavelengths of the order of 10 to 30 centimeters in length. Two experimental projects are now underway which can make excellent use of such ultra-ultra short wavelengths: they are the Metcalf-C.A.A.-M.I.T. system of blind landing and the United Airlines-Western Electric terrain clearance indicator (both of which have been described in these pages, in the August, 1938, and November, 1938, issues, respectively). In addition to these projects, very short wavelengths can be put to excellent use for marker beacons, traffic control, collision prevention, and obstacle detection.

One of the great difficulties in the way of developing these services to a commercial status is the low power of the hitherto-available generators of very high frequency energy. At frequencies above 500 Mc. (wavelengths less than 60 centimeters) it has been difficult to obtain more than 5 or 10 watts by conventional methods. The magnetron, capable of somewhat higher power, has been handicapped by excessive weight, frequency instability and highly critical adjustments. So the industry has been hopeful that some new approach to the production of high frequency energy would be uncovered.

This hope has been rewarded, in a big way, by announcements from three independent quarters of three new radical attacks on the problem which have been eminently successful, to the point where hundreds, rather than tens, of watts may be generated at frequencies as high as 3,000 Mc. The three sources are Stanford University, the RCA Manufacturing Company, and the General Electric Company. Scientists in these three organizations have perfected means of producing high power, which were independently developed, but which depend fundamentally upon one basic element, a beam of rapidly moving electrons. The means by which the beam is used differ widely in the three systems, but the result is the same, high power at extremely short wavelengths.

While it appears that all three generators will eventually be applied to the problems of aircraft radio, the first definite announcement to this effect has come from the group developing the Stanford University device, the "klystron". These devices are not only capable of generating as much as three hundred watts at a wavelength of 30 centimeters, but of doing so with good frequency stability, and at an efficiency of 30 to 40 per cent. Furthermore the klystron may be used as a receiver of high frequency energy, and this ability is equally as important as its ability as a generator, since receivers for the ultra-ultra short waves heretofore have been crude devices at best.

The application of the klystron is being made to the Metcalf-M.I.T. system of blind landing, through the joint collaboration of the C.A.A. which is financing the project through a contract to the Massachusetts Institute of Technology, the M.I.T. engineers and the Sperry Gyroscope Company which manufactured the klystron under license from Stanford University, which holds the patents. Here, in Stanford University, the saga of the klystron got under way. The desire for high frequency energy in copious amounts arose in the Stanford Physics Department in order to further studies in atom-smashing. The research program was headed by Prof. D. L. Webster and carried out by R. H. Varian (a Pan-American pilot on leave of absence), his brother S. F. Varian, Professor W. W. Hansen and Research Associate John Woodyard. John Easton, head of the Aircraft Section of the Civil Aeronautics Authority and Irving Metcalf, immediately saw the possibilities the klystron offered to numerous phases of aviation. Straightway these men went to California and succeeded in convincing the Stanford authorities that the Metcalf-M.I.T. blind landing

John Easton, Chief of C.A.A. Aircraft Section

system should be one of the first practical applications of the new device. Subsequently the Sperry Corporation acquired the manufacturing rights, and has produced several examples of the klystron suitable for test purposes. One of these was taken to Cambridge to the M.I.T. laboratories during February for a ten-day test, with highly satisfactory results. This model produced 300 watts, at

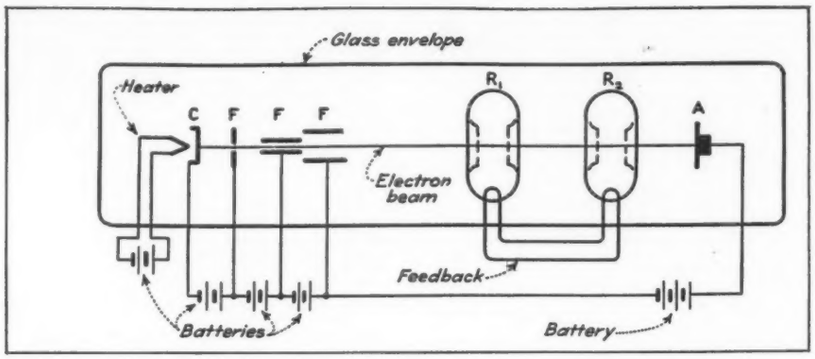


Diagram of the Klystron, the new u-h-f generator

wavelengths between 10 and 40 centimeters. At wavelengths as short as this, it is possible to radiate narrow beams from small, simple horn structures, and it is on this principle that the straight-line glide path is formed.

The principle of the klystron is shown in the Figure. At the extreme left is the cathode C, from which free electrons are liberated by heat. Beyond the cathode to the right is the system of focussing elctrodes, F, which directs the free electrons into a narrow beam, much like a stream of water issuing from the nozzle of a hose. The beam of electrons then passes through the first resonant chamber, R_1, called a "buncher". This chamber is made of metal in the form of a torus, or doughnut, shape. Across the hole in the doughnut are two fine wire screens through which the electron beam passes. The dimensions of the torus are chosen so that the chamber will resonate at the desired high frequency, that is, will set up a rapidly oscillating flow of charge from one wire screen to the opposite. The oscillations are initially excited by the impact of the electrons on the screens and are maintained thereafter by the feed-back connection referred to below.

The oscillation between the wire screens serves to divide the electron stream into groups, as it passes through the chamber. In other words the electrons are "bunched", and the stream leaves the first chamber divided into isolated electron groups. The spacing between the groups depends on the speed of the electron beam and the frequency of the oscillations in the first chamber. By employing a high beam velocity, it is possible to obtain appreciable spacing even at frequencies of billions of cycles per second (thousands of megacycles).

The "bunched" beam, still traveling at high speed then enters the second torus-shaped resonating chamber, R_2. This time the electron groups themselves excite oscillations in the second chamber, at the same frequency as that of the first chamber. Finally, by means of a wire circuit inserted through openings in the two chambers, part of the oscillation energy from the second chamber is fed back to the first chamber. This feed-back connection maintains the oscillations in the first chamber and augments their strength. Consequently the electron beam is "bunched" more vigorously in the first chamber, and in turn excites more vigorous oscillations in the second chamber, part of which is fed back to the first chamber. In this way an endless circle is built up, and the strength of the oscillation increases until no more power (power taken from the energy in the electron beam itself) is available, whereupon a steady state is reached.

The beam, on passing through the second chamber contains very large groups of electrons, corresponding to high energy per group, and this energy is delivered, at the oscillating frequency to the collecting anode A. From this anode the output power may be derived. Modulation of the output power, for signalling purposes, may be achieved by changing the speed of the beam, or by controlling the numbers of electrons in the beam, by means of a control grid associated with the focussing electrodes. The whole assembly, including cathode, focussing structure, two resonating chambers and collecting anode, is contained with a vacuum-tight enclosure from which all gas has been thoroughly exhausted.

The advantage of the device is, first, that the so-called transit-time limitation which depends on the speed of electrons in passing through a generator has been minimized by the fact that a beam of extremely great speed can be used, and secondly in the ingenious feed-back regeneration scheme which builds up the amplitude of the oscillations.

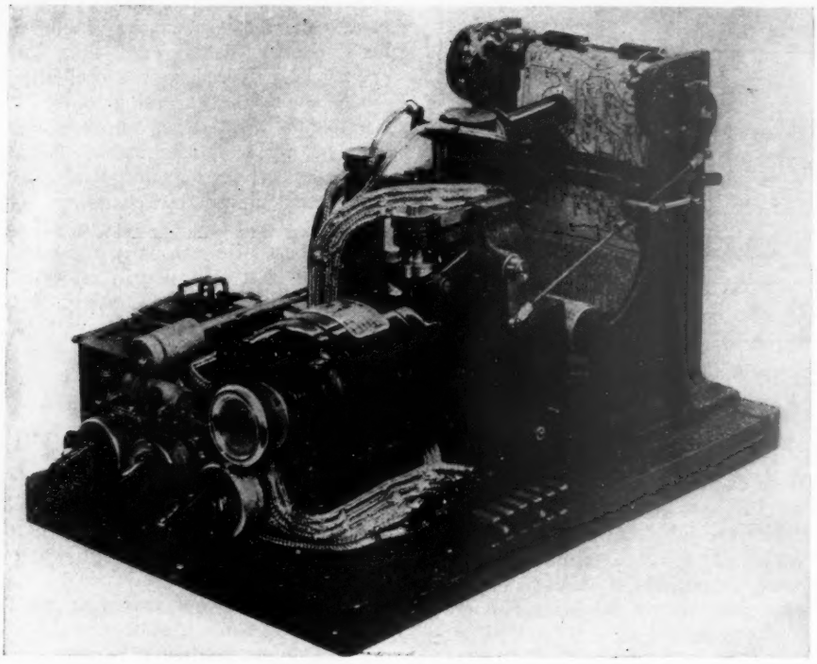
The klystron structure (which takes its name from the Greek word denoting the breaking of waves on a beach) may also be used for reception. In this case the first torus chamber is supplied with oscillating energy from an antenna, and succeeds in "bunching" the electrons which pass through it. The bunching process may then be regenerated through a second chamber, exactly as in the case of the power-generator. Experiments with this phase of the investigation have not yet been completed, but will be brought to the attention of AVIATION's readers as soon as information is released.

Irving Metcalf to whose system the Klystron is to be applied

Marker-beacon Receiver

Radio Receptor Corp. Brings out a New Model for 75 Mc. beacon signals

AFTER CONFINING THEMSELVES principally to airport transmitting equipment for beacon and communication use, the Radio Receptor Corporation has recently announced a receiver, a 75 Mc. marker beacon unit, designed to meet the CAA specifications for fan, cone and approach type marker beacons. The receiver is fixed tuned to 75 Mc, and employs an intermediate frequency of 6.325 Mc, derived from the signal input and a crystal-con-



The scanning mechanism of the Finch facsimile system, shown transmitting a weather map to receivers equipped with similar machines. The Finch Telecommunications Laboratories are now conducting flight tests to determine the feasibility of facsimile map transmission direct to aircraft.

trolled oscillator. The receiver responds to signals as low as 150 microvolts, modulated 30 per cent, and is receptive to three modulating frequencies: 400, 1,300 and 3,000 cps. Each of these modulation frequencies is used individually to control three signal lamps. Power supply may be 12 volts d.c. or 800 cycles, 115 volt a.c. In the d.c. case a vibrator and filter is used; with a.c. a tube rectifier and filter are used.

The receiver, shown in the accompanying illustration, is divided into two units, the signal lamp panel, which is mounted on the instrument panel, and the receiver which may be mounted wherever convenient in the ship. The lamp and control panel contains the on-off switch, a sensitivity-control switch and a phone jack for aural monitoring of the receiver output. The receiver is designed to a 70-ohm transmission line from the antenna, and is equipped for a rapid switch-over to an emergency power supply consisting of a 12-volt filament source and a 200-volt dry battery. The receiver measures roughly 5 by 8 to 20 inches.

Receptor's Beacon Receiver

"Waller Communicator"

A 150-watt aircraft transmitter weighing 62 lb. announced by Spartan School

WHAT IS CLAIMED TO BE a new low in weight for a highpower aircraft transmitter is the 62 lb. weight of a new 150-watt outfit developed in the Radio Laboratories of the Spartan School of Aeronautics at Tulsa, Oklahoma. Separate crystals on any desired three frequencies are employed, with remote control. The total weight of 62 lb. includes cables and dynamotor. The output antenna power is 150 watts, 100 per cent modulated, using class B operation (beam tubes) in the modulator. This power is extremely high, compared with the power ordinarily employed in any but the largest ships, but according to the announcement by the School, it falls within the requirements set up by the Federal Communications Commission.

Literature

Two releases of interest to owners and operators of aircraft radio

TWO RELEASES by commercial organizations, but of essentially non-commercial nature, have recently come to light. The first is *"Location and Elimination of Engine Ignition Interference to Aircraft Radio Receiver,"* a bulletin issued by the RCA Manufacturing Company, Camden, N. J. and available on request. The sources of interference, loop antenna methods of locating it, and filter designs for suppressing it are included, together with a survey of the shielding problem. The booklet is well worth the attention of everyone in the field. The second release is *"How to Get the Most Out of Your Aircraft Radio"* by W. P. Lear of Learadio, Roosevelt Field, Mineola, New York, likewise available on request. The discussion is divided into three sections: receivers, transmitters and directional devices. The language used is simple, and the discussion applies to all classes of equipment. It is recommended.

Peter Sandretto (right) of United Airlines demonstrates the finished model of the snow-static suppressor which United developed in cooperation with the Bendix Corp., and now installed on all United transport ships. The trailing wire, released electrically from the tail of the ship by the pilot, under bad conditions carries the static discharge far out in the slip stream, away from the receiving antennas.

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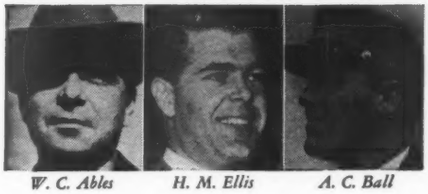
MEET THREE TYPICAL BOEING-TRAINED MEN



W. C. Ables *H. M. Ellis* *A. C. Ball*

W. C. Ables, Boeing School graduate in 1930, now holds the job of Station Manager, Seattle, for United. H. M. Ellis, a Boeing School graduate in 1935, is now Assistant Sales Manager for Hamilton Standard Propellers. A Boeing School graduate in 1930, A. C. Ball is a Flight Captain for United Air Lines. Boeing School men are making good in aviation all over the world. Why not start your course now?

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BOEING SCHOOL RECORD
Dec. 1937 — Nov. 1938

Months	*Graduates*	*Placements*	*No. Co's Employing Graduates*
1937			
December	29	7	3
1938			
January	7	14	6
February	1	9	7
March	40	16	6
April	6	13	3
May	6	12	6
June	30	5	4
July	4	8	4
August	2	3	3
September	29	12	10
October	1	6	5
November	3	6	4
TOTAL	158	111	28

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Courses requiring High School only
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- ☐ Airline Mechanic and Operations
- ☐ Commercial Pilot and Operations
- ☐ Airline Mechanic
- ☐ Private *(or)* Solo Pilot
- ☐ Limited Commercial Pilot
- ☐ Aircraft Sheet Metal

Course requiring 2 yrs. of college
- ☐ Air Transport Engineering

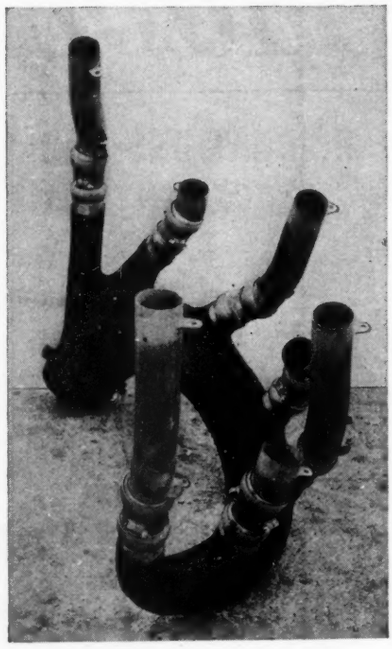
Courses for engineering graduates only
- ☐ Airline Technician
- ☐ Airline Meteorology

Course requiring special training
- ☐ Special Airline Pilot

NOTE: Link trainer and modern multi-motor instruction available to students in all courses

BUYER'S LOG BOOK

What's New in Accessories, Materials, Supplies, and Equipment



Ryan ball and socket joints

Slip Joint

Ryan designs new expansion connections for manifolds

THE RYAN Universal Exhaust Manifold Joint is a new development in exhaust manifolds designed to eliminate some of the troubles heretofore experienced with exhaust manifold installations. In the patented Ryan joint it is claimed that complete freedom of movement is provided, without gas leakage, under all service conditions. This permits attaching the manifold direct to the engine mount, and makes possible a simpler one- or two-piece main manifold, without slip joints. The gas-tight feature is of particular importance where turbo-superchargers are to be used. The Ryan unit consists of two ball and socket joints in the individual exhaust pipe which connects the cylinder exhaust port to the manifold collector ring. Incorporated in each joint is a conventional type piston ring to act as a gas seal. Service tests on a single engine of the Douglas DC-4 has resulted in equipment of all four engines with the new universal joint manifold. Similar manifolds with Ryan universal joints are being manufactured for the fifty Lockheed bombers being built for Australia.—AVIATION, *March, 1939.*

Oil Cleaner

Cuno high pressure filter for hydraulic oil

A CUNO AUTO-KLEAN FILTER is now available specially designed for installation on the pressure side of hydraulic pumps supplying hydraulic fluid to flap and landing gear actuating devices. It is built to withstand a maximum working pressure of 1000 lbs. per square inch hydraulic, and is subjected to a test pressure of 2000 lbs. per sq. in. hydrostatic. This filter is of the multiple disc type and is continuously cleanable while in operation. It is customarily furnished with spacing equivalent to 170 screen mesh. Cuno filters are also available for installation on the suction side of the pump, or they may be built directly into the storage tank. They are designed for a maximum pressure drop of ½ lb. per sq. in.—AVIATION, *March, 1939.*

Cuno hydraulic filter

Safety Tank

Martin "Fuel Cell" vibration proof fuel containers

PATENTS have been issued to the Glenn L. Martin Company, Baltimore, covering new type fuel tanks made of thin fabric impregnated with synthetic rubber. Subjected to an accelerated disintegration test which was devised to destroy any tank's usefulness in less than 50 hours, the Martin vibration-proof "Mareng Fuel Cell" remained gas-tight after 700 hours of abuse, even though the supporting structure required repairs several times during testing. In the "fuel cell" type tank the need of gas-tight metal tanks is eliminated. Bags of treated fabric are designed to the shape of existing interior compartments in wings, fuselage, or floats, and are laid in place somewhat as an inner tube is installed in a tire casing. Instead of being cut to size, however, these bags are made slightly over-size, so that the fabric is never subjected to stretching or twisting. Also, the Mareng fuel cell eliminates the action of corrosive elements in the fuel, on the metal of tanks or plane structure. A Mareng fuel cell pierced by bullets on a foreign war front did not ground the plane, but permitted the pilot to return to his base more than 100 miles away, due to the tendency of the bag to be self sealing when slit.—AVIATION, *March, 1939.*

Mareng fuel cell

Compass

New Pioneer instrument based on army model

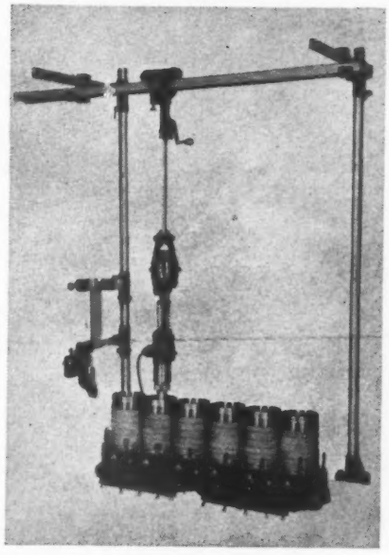
A MAGNETIC PILOT'S COMPASS designed for panel mounting and similar to the Air Corps Model B-17 is now offered by the Pioneer Instrument Company. Flight testing has shown the compass to have amazingly little northerly turning or acceleration errors. In order to produce exceptional stability and freedom from northerly turning and acceleration errors the card is mounted in a moderately large bowl and has somewhat more damping than other pilots' compasses. The period is somewhat longer than that of 1808 model which has been popular with the airlines. These factors reduce the overswing and make the instrument very steady. The pivot is firmly fastened in the card and rests on a jewel mounting in a cushioned post to assure satisfactory operation under vibration. Ample provision for liquid expansion and contractions permits operation under all conditions of temperature and pressure. Light from a standard Pioneer Ringlite bulb projects through the top of the window, illuminating the visible portion of the card and the lubber line with no perceptible glare.—AVIATION, *March, 1939.*

Pioneer Type B-17 Compass

Hall Eccentric Grinders

Wide variety of production and service equipment is offered

AMONG THE MANY TOOLS embodying the eccentric grinder principle made by the Hall Manufacturing Company is the Model VPA Vertical Type Production Grinder for valve seats which is used by many engine manufacturers here and abroad. For limited production or service work the Model EJA is offered. Several other types



Model VPA Production Valve Seat Grinder

are offered. In these models the grinding wheel moves concentrically during the dressing operation and eccentrically for grinding. In the wide range of tools offered by Hall is the Model 881 Complete Valve Shop which constitutes a selection of service equipment mounted on a cabinet on wheels.—AVIATION, *March, 1939.*

"The Hornet"

Black & Decker announce a new midget drill

A LIGHTWEIGHT PRODUCTION DRILL known as "The Hornet" has been developed by Black & Decker Manufacturing Company, of Towson, Maryland. Of 3/16 in. capacity, the new electric drill has a splined gear mounting, ball bearings, screened air inlets, ample fan, new grip type switch, and a universal motor with an operating speed of 3700 r.p.m. or an optional speed of 5200 r.p.m. at no extra cost. Total weight is only 34 ounces despite the fact that it is intended for continuous production work for aircraft and light industrial jobs.—AVIATION, *March, 1939.*

For Emergencies

A portable, battery operated unit by U-C Lite

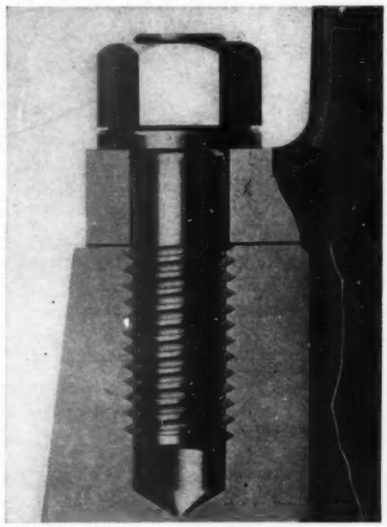
A PORTABLE LIGHT which promises to be of special value for aircraft and airport emergency night work has been perfected by the U-C Lite Manufacturing Co., of Chicago. A high power, portable storage battery lamp, the U-C Lite is said to throw a beam more than a half mile and will burn continuously for ten hours. An auxiliary bulb, built into the light, will burn for 60 hours at a reduced intensity.—AVIATION, *March, 1939.*

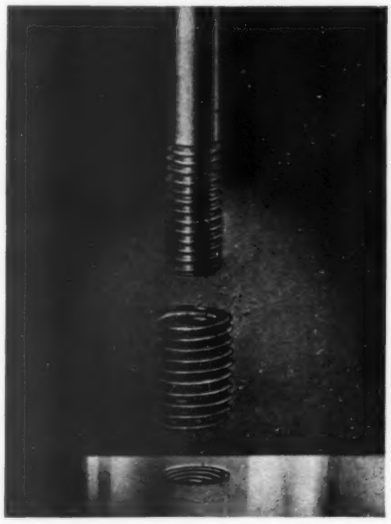
"Aero-Thread" Screw

Spirally Wound Insert Provides Bearing For Screw in Light Alloys

A SPIRALLY WOUND INSERT of bronze spring wire fitted into a tapped hole is the principle used in the Aero Thread System just introduced by Air Associates, Inc. When screwed into place the insert becomes a part of the tapped hole and furnishes a bearing in the softer metal for the screw thread.

(*Turn to page 87*)





How "Aero Thread" Insert is used

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On a routine business flight, recently, in a **SPARTAN** ***Executive,*** the 1,050 miles between Tulsa and Washington were flown in 4 hours and 40 minutes.

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The ***Executive*** will add days to your business week and you will know a new meaning to travel in luxurious comfort. The **SPARTAN** ***Executive*** is THE airplane with which no other can compare, *proof will be on your desk in response to a phone call, telegram or letter.*

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THE WORLD OVER
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CONSTRUCTION—*of All-Metal on a bridge like frame, giving strength unknown to old wood and fabric construction.*

BEAUTY—*unexcelled in streamlined exterior, luxury and comfort of cabin interior. The ideal airplane for Ambulance and Aerial Photography, available with special cabin arrangements.*

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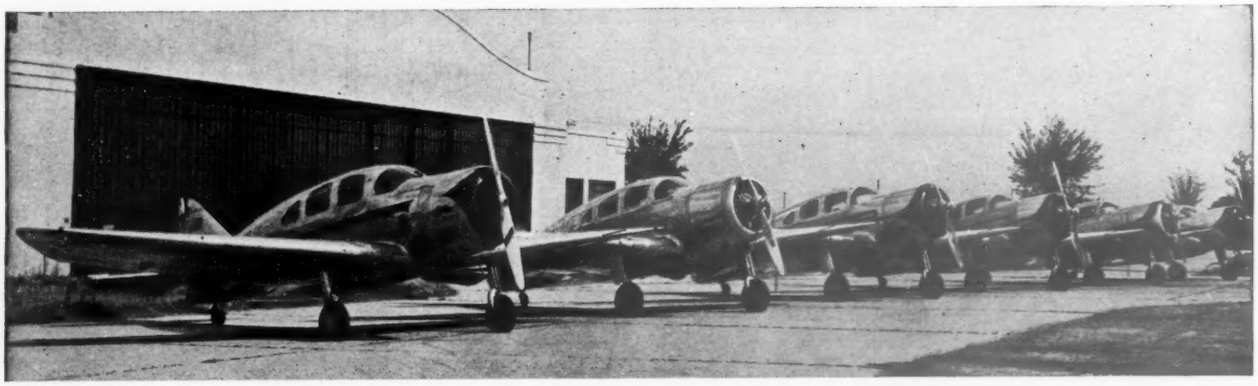


TOMORROW'S AIR TRANSPORTATION TODAY

SPARTAN AIRCRAFT COMPANY

BUILDERS OF SPARTAN ALL-METAL COMMERCIAL EXECUTIVE MILITARY CONVERSION 7W-F AND MILITARY ZEUS

TULSA, OKLAHOMA

THE AVIATION NEWS

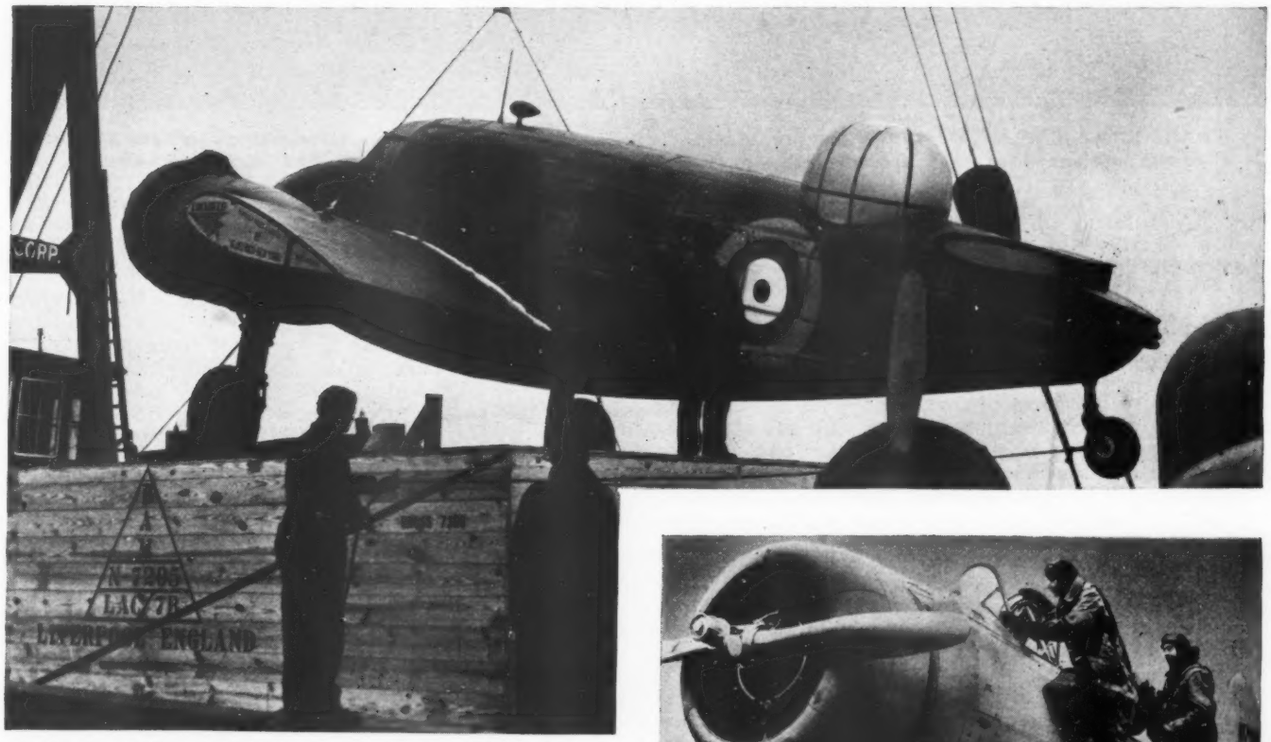
REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

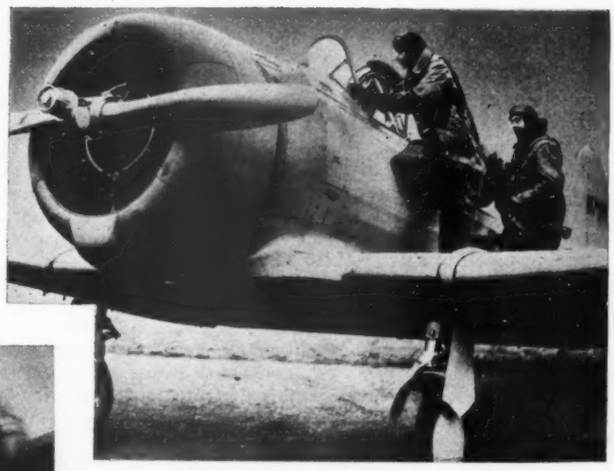
MARCH 1939

Export Issue Agitates Washington

(Story on page 70)

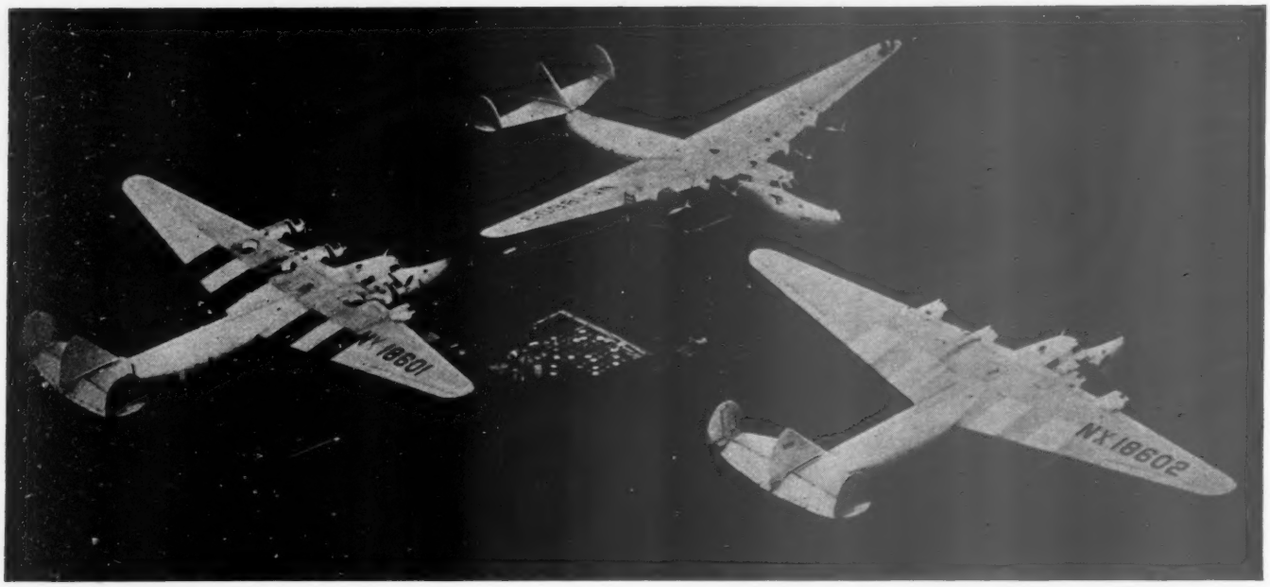


BOMBERS FOR BRITAIN. First of the 250 Lockheed bombers for the RAF being loaded on a lighter at the seaplane base at New York Floyd Bennett Field. All openings have been covered and all seams protected against corrosion.



TRAINERS FOR BRITAIN. First of the first lot of 200 North American "Harvard" trainers is given the once-over by RAF pilots at Grantham, England. A second lot of 200 has just been ordered by the British Air Ministry.

FIGHTERS FOR FRANCE. Curtiss-Wright test pilot, Lloyd Child about to give one of the French Hawk 75As "the works". In the course of testing this particular machine he recorded a 575 mile an hour terminal velocity dive.



TRANSOCEANIC FLEET: While the first Boeing Clipper was being put through its paces, numbers 2 and 3 caught up and here they are all ready to fly over oceans in the service of Pan American Airways.

Armaments Argument

Will export sales obstruct our own rearmament program?—agitates official Washington.

Biggest story of the month, aviation-wise, centered about the problem of whether it was a fellow named Elmer who had sat in the back of a bomber that had crashed, or whether it was a man named Chemidlin, a member of the French Aviation Mission to the United States. When it was discovered that Elmer was at home in bed at the time of the accident, Mr. Chemidlin's identity became firmly established and instantly questions began to fly back and forth in official Washington as to why a Frenchman was riding around in the back seat of one of our latest bomber designs. The situation became more complicated when it was brought out that permission to make the flight had come not from the War Department, but through Treasury channels. A good many pages of testimony have been taken since (a large percentage of which has been off the record), without doing much to clarify the matter in the minds of the public. Apparently the biggest difference of opinion between members of the administration who were bending their best efforts to help France out of a bad spot, and the heads of the War Department, came about over the question of not should we sell some of our best machines to the French, but if we do, will it endanger deliveries of new machines for our own air force under our expansion program.

As we go to press there seems to be no clear answer yet to that question. Obviously it will take a good many months to get money appropriated and to get orders placed for our own use. In the meantime, the administration seems to feel that it will be all to the good if we can get into immediate production in many of our factories for export purposes, with orders that can be cleaned up and out of the way by the time actual work could be done on our own machines. Secretary Morgenthau told the investigating committee that "instead of being ashamed, I think it is something to be proud of. $65,000,000 for American workmen's pocketbooks is good stuff and I don't see why there is anything particularly secret about it or anything particularly to apologize for."

Be that as it may, the French government mission sailed back to France in late February, after having placed orders for new airplanes with four United States manufacturers, as follows: 100 Curtiss Pursuits (similar to the 100 ordered last June); 115 Martin Model 163 Bombers; 100 Douglas B-19 Bombers; and 200 North American BT-9 Trainers.

In the midst of all the dither, the House passed and sent to the Senate on February 15 the May bill to increase the Army Air Corps to 5,500 serviceable airplanes, which, with other expenditures authorized in the bill for expansion, will involve an outlay of about $376,000,000. Included also is a provision to authorize the training of pilots in approved civilian schools, the expenditure of some $2,375,000 for improving the garrison facilities in the Canal Zone, and the placing of $34,500,000 worth of "educational orders" between now and 1941 (and at the rate of $2,000,000 a year thereafter) "to familiarize private manufacturing establishments with the production of munitions of war of special or technical design, non-commercial in character." The last provision, of course, covers more territory than the provision of aviation equipment. Funds are also provided under the May bill to cover the Civil Aeronautics Authority's pilot training program.

Significant, perhaps, of the state of mind of the country at the moment, the fact that the vote on the May bill was 367 to 15.

As the Air Corps bill passed the House, it was understood that the Naval Affairs Committee had tentatively approved a companion measure for the Navy, the Vinson bill, to expand air and submarine bases. The committee had voted 14 to 1 to leave in the bill the Navy Department's recommendation for $5,000,000 for improving the harbor at Guam to make it more suitable for flying boats. This particular item had been the center of considerable discussion after the Japanese government had protested the installation of further military equipment on Guam. But later (Feb. 23) the House removed the Guam provisions in the Navy bill by a vote of 205 to 168.

United Front

Aero Chamber Reorganizes. West Coast dissenters back in fold.

THE AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA went through the wringer at its annual meeting on January 26 and came out with a new face and with some new backing. In a series

of last-minute maneuvers before the meeting, Leighton W. Rogers withdrew his name as a candidate for re-election to the presidency and was succeeded by Colonel John H. Jouett. With Col. Jouett was elected a new slate of officers including Robert Gross, president of Lockheed Aircraft Corp., as vice-president; W. T. Piper, president of Piper Aircraft Co., as vice-president; C. G. Taylor, president of Taylor-Young Airplane Co., as secretary; and Frank J. Walsh as treasurer.

The new executive committee: W. H. Beal, Aviation Manufacturing Corp., New York; Laurence D. Bell, Bell Aircraft Corp., Buffalo, N. Y.; Donald L. Brown, United Aircraft Corp., East Hartford, Conn.; Clayton J. Brukner, Waco Aircraft Co., Troy, O.; Sherman M. Fairchild, Fairchild Aviation Corp., New York; Courtlandt Gross, Lockheed Aircraft Corp., Burbank, Calif.; Charles Marcus, Bendix Aviation Corp., New York; Thomas A. Morgan, Sperry Gyroscope Co., Brooklyn, N. Y.; James Murray, Boeing Aircraft Co., Seattle, Wash.; Guy W. Vaughan, Curtiss-Wright Corp., New York. The members of the executive committee are on the new board of governors, which also includes Walter Beech, Beech Aircraft Corp., Wichita, Kans.; Carl I. Friedlander, Aeronautical Corporation of America, Cincinnati, O.; Richard Goldsmith, B.G. Corporation, New York; M. B. Gordon, Wright Aeronautical Corp., Paterson, N. J.; W. D. Guthrie, Roosevelt Field, Mineola, N. Y.; S. Paul Johnston, Aviation Magazine, New York; Temple Joyce, Brewster Aeronautical Corp., Long Island City, N. Y.; H. W. Lake, Socony-Vacuum Corp., New York; Charles L. Lawrance, Lawrance Engineering & Research Corp., Linden, N. J.; A. I. Lodwick, Stinson Aircraft Division of Aviation Manufacturing Corp., New York; Oliver Parks, Parks Air College, East St. Louis, Ill.; E. T. Price, Solar Aircraft Co., San Diego, Calif.; J. Story Smith, Jacobs Aircraft Engine Co., Pottstown, Pa.; W. M. Brinckerhoff, Private Fliers Association, Hackensack, N. J.; John Dwight Sullivan, New York; J. Carlton Ward, jr., Pratt & Whitney Aircraft Division of United Aircraft Corp., East Hartford, Conn.

AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

CAA job ticket. Nearly finished with the certificates of C & N, which were delayed by airline resistance to terms-and-conditions riders . . . Getting well along with mail rate adjustments, but this will never end; next thing is formulation of basic rate policy on all cargo . . . Pilot training, which incidentally put CAA in the rose-tinted spotlight of public acclaim, is and will be indefinitely near the head of the job list; not officially, but actually, CAA will assist in writing the $10,000,000 training bill . . . Airport survey is about done, but after that will come a sales job on Congress to get the subsidy, if recommended as expected, then planning the program . . . Revision of CAR is going ahead with exploration of private flying problem from Dan to Beersheba . . . Gravelly Point airport, new home for CAA, with streamline and chromium plate, gets attention.

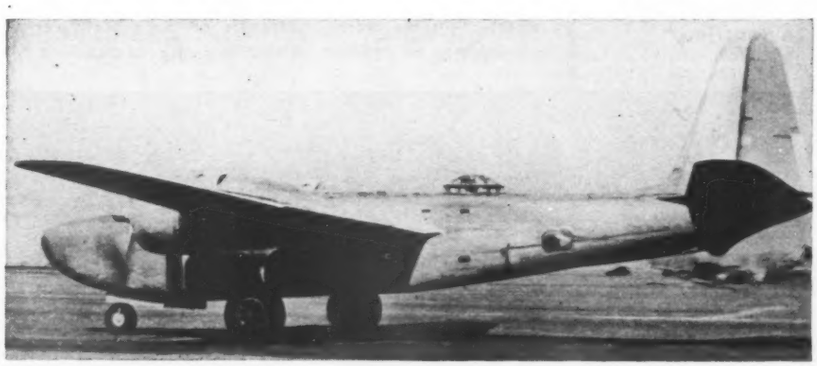
Economic and technical advisor is a Washington title under which you can play marbles, or eat lunch with FDR. Dr. Ed Warner, former editor of AVIATION, first assistant secretary of Navy, is it for the Authority. The announcement of his appointment doesn't say what he does, and neither does Mr. Warner. By grapevine, though, you learn that he helped rewrite the bollixed airport survey, and took part in some medium hot arguments on terms and conditions to be attached to certificates of C & N. Warner has by far the broadest and longest aviation experience of any man in the CAA; on some occasions he will play first fiddle.

Transatlantic tacticians have it that when our Mr. Hull heard that Britain would fly into Montreal, he promptly announced that we (Pan American and the United States) would breeze right on over to Paris—or Marseilles. France is where most Americans go anyway. And most people that go are Americans. Why not let US transport have the business? OK America, said England, you can have the ice cube circle and start when ready . . . Only a few eyebrows were lifted when Richard Southgate left the State Department to join PAA. Southgate and Thomas Burke presumably were contenders for job as Chief of the new International Communications Division, which includes aviation. Burke got it.

Expressions on air express are not all sweet and gentle. CAA officials disagree on whether a survey of potential volume at hypothetical rates should be made now, or later, and air transport men differ radically. Railway Express Agency and air transport are both scared of each other. REA could bale out, leaving air transport the costly job of setting up a "pick-up-and" system. Air-transport might get CAA to tear up REA's air franchise, which might be a bonanza some day. Those who thought CAA would be on the edge of malfeasance if it didn't study express, what with mail pay increases and passenger cuts in the offing, have no case. CAA's rate fixes are temporary, and any time express seems being ignored as prospective revenue, more revision would be in order.

Who put Humpty Dumpty together again? If the War Department did not actually pull a wire for reorganization of the Aeronautical Chamber of Commerce, it is at least pleased with the outcome. Not only the WD but statistical Washington in general welcomes the prospect of getting comprehensive figures on the industry. Colonel John H. Jouett, the new boss, not only is expected to do job for the US airplane business, but he is no slouch on foreign sales.

Dummy airport report was sent to Congress on February 1 under the flattering title "preliminary" report. It was nothing but a paste-up of dog-eared statistics. CAA wasn't kidding itself or Congress; the dud was submitted because the law says so. The real thing is promised for March 15. It had to be re-written because the learned gentlemen of the survey filled it with college words and not enough fireside conviction. Likewise a few indiscretions are reported to have crept in.



INSTIGATOR: This is the ship that crashed, killing John Cable and starting the big ruckus in Washington,—a Northrop Attack Bomber.

"SAY, DAD, LEWIS HOLY HAS A WONDERFUL 4 YEAR COURSE

The basic course given is aeronautical engineering. In addition, the course includes business administration, organization, operation, in all of those phases connected with the aviation industry, as well as subjects devoted to piloting airplanes which are covered with the engineering course, such as: meteorology, navigation, and radio.

All students, if they desire, are given twenty hours of flight training with the Engineering Course. All students must be enrolled in the Engineering Course to take flight training. A complete 300-hour course is given if desired and taken over the same period as the engineering. Ships of modern manufacture, ranging from 50 to 330 horse power are used in both open and closed types.

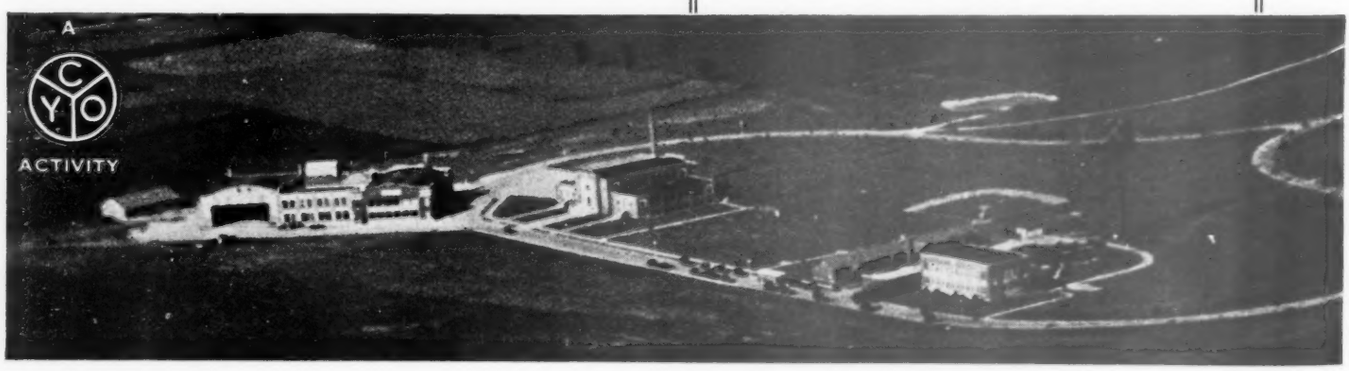
This school is open to graduates of approved high schools—boys whose scholastic standing is in the top quarter of their class. These students, preferably, should have majored in mathematics and the sciences; those who have not done so can take these studies in the first year with the freshman aeronautical college subjects. This school has been in operation for seven years and was only open to boys who qualified after extremely rigid entrance tests and who maintained a rigid academic standard. Now this school is open to boys of all faiths who wish to work hard to qualify for a lasting future through these rigid standards.

The course is run on a four-year basis, summers included. Students enter in June or September and graduate in September or June four years later. This means that the student attends school in the summer as well as in the winter, leaving four weeks throughout each 12-month period devoted to vacation.

NON-SECTARIAN

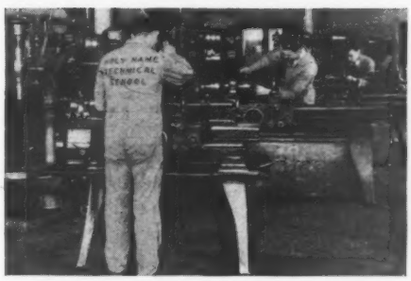
The school is under the personal direction of Bishop Bernard J. Sheil, auxiliary bishop of Chicago and founder of the nation-wide Catholic Youth Organization, of which this school is a division. However, the school is open to boys of all creeds and denominations—it is strictly NON-SECTARIAN—religious facilities are provided for those who wish to attend. Again we emphasize our very strict attention to the moral atmosphere of the school, plus our attempt to maintain strictly home-like surroundings.

A C Y O ACTIVITY



BUDDY WRITES THAT THE NAME SCHOOL OF AERONAUTICS

AND ALL OF THE STUDENTS SAY IT'S AN IDEAL PLACE FOR ANY FELLOW!"



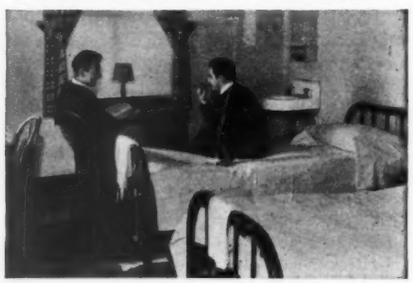
A tremendous amount of practical experience is gained in the well equipped machine, forge, motor, and wood-working shops. A competent engineer cannot be produced without a full amount of this type of work under experienced instructors. The machine shop pictured is fully equipped with lathes, shapers, millers, grinders, drill presses, etc.

This picture shows students in Aeroplane Rebuilding Shop—a monocoupe is being rebuilt for Wayne Thomis of the Chicago Tribune. Airplanes requiring repair and rebuilding are brought in and the students, under careful supervision, do the actual reconstruction work. The students also study fabrics and dope and become skilled in working with them. Thorough training is gained in the maintenance of airplanes, engines and accessories.

Student training during the entire course is intensive and comprehensive. Upon graduation the student is skilled in every detail of engineering, aeroplane construction, and maintenance—as an example, the picture shows instruction being given in spraying a covered wing. This school stresses the acquisition of an extremely comprehensive mechanical knowledge as well as a theoretical engineering and design knowledge.

Military Assembly—just before entering the dining hall. Parents may well be satisfied that their sons will receive the ultimate in an aeronautical education as well as training in all phases of social activities. This type of education is designed to promote the highest moral foundation with the problem of character building upmost.

Students at luncheon. The dining hall is large and airy. The cafeteria method of service is used. Both the dining hall and kitchen are under the supervision of the school officials. Refrigeration facilities are ample. The foods brought into the school are all of finest quality—menus vary, and special foods are prepared "just like mother used to make" to gladden the hearts of the boys.



The students live at the school throughout their academic period in student rooms—two boys to the room. Medical and dental attention, laundry and board, are furnished as an integral part of this course. The students are supervised at all times in recreational and social activities by competent prefects. Social functions are given throughout the year—supervised athletics are part of each course—boxing, swimming, and other major sports are included.

The time devoted to the four-year aeronautical engineering course requires in excess of 4500 class hours which is approximately 700 hours in excess of the ordinary four-year engineering college course. A flight course of 300 hours is offered as optional, including advanced blind flight and airline procedure as a part, in modern flying equipment ranging from 50 to 330 horse power. Students must take the aeronautical engineering course to be eligible for flight training.

The aeronautical instruction leads to a Bachelor of Science degree in aeronautical engineering. Flight students will receive commercial licenses from the Civil Aeronautics Authority and all students will receive airplane and engine mechanics licenses during their instruction period. Graduation from this school is positive assurance that the student is fully equipped to enter the aviation field and measure up to the qualifications demanded by the choicest positions.

The school grounds comprise 300 acres and front on a 160-acre (½ mile square) airport devoted to its use. Tennis courts, swimming pool, ice skating rink, baseball diamond, are some of the recreational facilities provided. The school is located 35 miles from Chicago's loop, 6 miles north of Joliet, and accessible by quick bus transportation to and from Chicago with railroad connections from Lockport and Joliet. Visitors are welcome to inspect this school at any time.

Before you decide on a school for your boy, consider the many advantages of the Lewis Holy Name School of Aeronautics.
Mr. Father—If your son has a high scholastic standing and he is interested in Aeronautics, then make it your business now to investigate Lewis Holy Name School of Aeronautics. We are sincere in saying that you will find this to be an ideal place for your boy. The coupon will bring you complete free information.

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MANUFACTURERS REPORT—

ROBERT E. GROSS, president of Lockheed Aircraft Corp., reports 1938 gross sales of approximately $10,000,000, a one hundred per cent gain over 1937. At the same time he announced that his company would make delivery on at least $30,000,000 worth of the $35,000,000 backlog now on hand, during 1939. With 50 additional bombers ordered by the British, Lockheed now has orders for more than 300 airplanes of civil or military type. Payroll figures showed approximately 3600 men at work on February 10th, a 79 per cent gain over the 2005 workers employed at the same period of 1938. Commercial deliveries in January and February have included three 14s to the French Air Ministry of the Air Afrique line between Marseilles and Madagascar, two Electras to Servicio Aereo Colombiano, Republic of Colombia, while deliveries of the British bomber type started early in January. The company has under consideration plans for the sale of additional common shares. Last financing done by Lockheed was a public offering of 150,000 shares at $11 in December, 1936, and the company has utilized banking facilities during 1938 to provide funds necessary to handle the rapid expansion in business. Its authorized capitalization is 1,000,000 shares of $1 par value common stock, of which 660,879 shares were outstanding at the end of June last, while options outstanding amounted to 1,667 shares.

TENTATIVE ORDERS for equipment are being placed by North American Aviation, Inc., on the basis of a duplication of the British order placed with the company last August for 200 combat-trainers. Deliveries of the original order are being made at about the rate of sixty a month, establishing a new high rate of production for the company. Company's backlog in February was more than $20,000,000.

UNITED AIRCRAFT CORPORATION announced the receipt of orders for Pratt & Whitney engines and Hamilton Standard constant speed propellers to power an order for 200 training planes which North American Aviation has received from the British Government. The engines are of the 9-cylinder Wasp type rated at 600 hp. for take-off.

BOEING AIRCRAFT CORPORATION made two notable deliveries within a few weeks: the Boeing Clipper on January 30th to Pan American Airways at the mouth of the Columbia river in Oregon; and the first of the thirty-nine YB-17A Flying Fortresses, to the Army's experimental station at Dayton, O.

A CONTRACT for ten biplanes and spare parts has been placed with Beech Aircraft Corp. by the Army Air Corps. The planes will be powered with Pratt & Whitney 400 hp. Wasp Jr. engines.

HAVING received final delivery of an earlier contract for Wacos, the Brazilian government has placed an additional order for fifteen planes with the Waco Aircraft Corp. Delivery will start early in April on planes and parts, costing about $225,000.

THE TREASURY DEPARTMENT has ordered for the Coast Guard, from Grumman Aircraft Engineering Corporation, three 8-passenger, high speed, twin-engined G-21 amphibians powered with two Pratt & Whitney 400 hp. Wasp Jr. engines, costing approximately $204,000. The ships will be used for coastal patrol and rescue work.

SINCE 1925 the Parts Division of Edo Aircraft Corp. of College Point, L. I., has served the whole aircraft field as sub-contractor in the design and manufacture of all-metal float gear. The company now announces its availability for the regular production of wing tip floats, main floats, float bulkheads, flying boat hulls, hull bulkheads, monocoque fuselages, fuselage bulkheads, wings, wing beams and ribs, control surfaces, flaps, landing gear legs, skiis, fabricated struts, fire walls, seats, fuel and oil tanks, bomb racks, and ammunition boxes and chutes.

BREWSTER AERONAUTICAL CO. of Long Island City has added 100 men to its working force. James Work, president, commenting on the increased volume of business on hand and in prospect, said that details for new financing for the company will be announced shortly.

PASSENGER REVENUES on Northwest Airlines having showed an approximate 100 per cent increase for December, 1938 over the same month in 1937, Croil Hunter, president, announced the purchase of six Douglas 21-passenger DC-3s to augment its present fleet. The purchase involves about $860,000, and the new ships will be powered with Pratt & Whitney twin row Wasp engines rated at 2400 hp. for take-off. Delivery of the first plane is scheduled for April.

LONGER and longer grows the Glenn L. Martin Co. payroll. On January 31 it reached 4,128, for the Middle River, Md., factory, an all-time high for the fifth successive month. The plant is operating 16 hours a day, five days a week, with 1400 employees on night shift. President Martin stated that on a 24-hour, 7-day working schedule, production could be increased to 1200 planes a year.

EMPHASIZING existing aircraft production facilities, aircraft leaders of Southern California have indicated their ability and willingness to meet any reasonable demand for military aircraft without material expansion of existing facilities. Donald Douglas, J. H. Kindelberger, and Robert E. Gross have stated that the combined capacity of their three plants alone would total approximately 4,000 planes per year if work were concentrated on the types now in production. Official estimates place the current capacity of the North American factory at ten planes per working day, or approximately three thousand a year; of the Douglas factory at 600 planes per year of the twin engine bomber or transport type, and Lockheed at 300 per year of the transport or bomber type. North American is now rolling four planes per working day off the assembly lines, and Lockheed is nearing one a day of the British bomber type.

INSURANCE on the projected fleet of nine Pan-American Airways trans-Atlantic flying boats has been placed with the United States Aviation Underwriters and Associated Aviation Underwriters, each taking half the amount insured. Two firms handled the placing, Parker & Co., represented by J. Brooks B. Parker, and OBrion, Russell & Co., represented by J. A. Sargent of Boston. Mr. Sargent is quoted as saying that the planes would have an average value of $675,000 each, and that they had been covered for 70 per cent of this value. The insurance involved is solely hull coverage.

AMONG the orders recently accepted for delivery by Lycoming Division of Aviation Manufacturing Corp., Williamsport, Pa., are 50 Lycoming 55 hp., dual ignition engines sold to Crowther, Ltd., of England, 100 Lycoming 50 hp. engines to Aeronautical Corporation of America for the Aeroncas, and 100 Lycoming 50 hp. engines to Piper Aircraft Corp. for the Cubs.

EDMUND T. PRICE, president of Solar Aircraft Co., has announced that business for the eight months ended January 7, 1939, exceeded the same period of 1937-38 by 36 per cent. An additional manifold order from Lockheed is reported as bringing Solar business to a new high. Deliveries are soon to be completed on a $100,000 Boeing manifold order.

Moving Days

ECLIPSE AVIATION, Division of Bendix Aviation Corporation, is "at home" in its new plant at the junction of New Jersey State Highway Routes 2 and 6, at Bendix, N. J. The plant consists of three buildings (affording approximately 350,000 sq. ft. of actual floor space), and includes a hospital unit and parking space. It has direct access by

air through Bendix Airport (formerly Teterboro). Plans call for later erection of a modern foundry building to supplant the present foundry located at Little Falls, N. J. Other new inhabitants of Bendix, N. J., are Pioneer Instrument Co., which is now occupying its recently completed and expanded plant, and Julien P. Friez & Sons, a branch of the Bendix Corp., which has purchased a site for a new and larger plant, to be completed next summer. The plant, to consist of one large structure, is to cost approximately $500,000.

DONALD L. BROWN, president of United Aircraft Corporation, announced plans for rearrangement of the company's manufacturing facilities to provide increased space necessary for immediate expansion of production in the engine and propeller divisions of the corporation. The Chance Vought Aircraft division, manufacturers of naval airplanes, will be moved within the next few months from East Hartford to Stratford, where it will occupy jointly with the Sikorsky Aircraft division the present Sikorsky factory. The Hamilton Standard Propellers division in East Hartford will then be moved to the vacated Chance Vought plant, and the Pratt & Whitney engine division will be expanded to occupy the present Hamilton Standard factory, which directly adjoins the engine plant.

PROFITS AND LOSSES

» FOLLOWING APPROVAL by stockholders of the Menasco Manufacturing Company of a proposal to increase authorized capitalization from 500,000 shares to 750,000 shares of $1 par value common stock, Mr. Gardner Carr, president, announced that a public offering of stock would be made in the near future. Additional capital so derived would be used for current plant expansion, develoment of engines of higher horsepower, and for working capital. The company is now making delivery on an order of 1,000 Covic Diesel engines for the Northill Company.

» BELL AIRCRAFT CORPORATION has announced the adoption of a plan for issuance to holders of common stock and to holders of outstanding warrants to purchase common stock, of rights to subscribe at $21 a share for 40,000 shares of common stock, on the basis of one new share for 5.25 shares now held by them.

» HOWARD AIRCRAFT CORPORATION has filed a registration statement with the SEC covering 500,000 shares of $1 par value common stock, and common stock purchase warrants evidencing the right to purchase 100,000 shares of common stock. Pistell, Wright & Co. will offer publicly 400,000 shares at $3 per share, reserving the remaining 100,000 shares against exercise of the common stock purchase warrants. The corporation will deliver to the underwriter warrants evidencing the right to purchase 100 shares of common stock for each 400 shares of the 400,000 shares of common stock sold or purchased by the underwriter. Shares of common stock acquired by the underwriter upon the exercise of the warrants are to be offered to the public at an estimated price of $3.60 per share. The warrants are exercisable at $3 for each share of common stock to Feb. 1, 1940; thereafter to Feb. 1, 1941, at $3.50 per share; and thereafter to Feb. 1, 1942, at $4 per share. Proceeds of the issue are to be used for inventories, construction, development, debt, and for supplying working capital.

» AVIATION & TRANSPORTATION Co. (formerly Cord Corporation) and Subsidiaries, for year ending Nov. 30, 1938, net loss after surtax on undistributed profits, $212,316, against $340,557 loss in preceding year. Current assets at Nov. 30, 1938, $3,294,790, liabilities, $130,596; against assets of $3,736,760 and liabilities of $152,681 for the preceding year. Company's stock holdings had a market value of $6,870,165 on Nov. 30, 1938.

FAR SEEING INVESTORS

Do you see ahead a period of EXPANSION *for*

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Makers of Accessories
Operators of Air Services ?

The stocks and bonds of many of these companies offer speculative opportunities

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AVIATION DEPARTMENT

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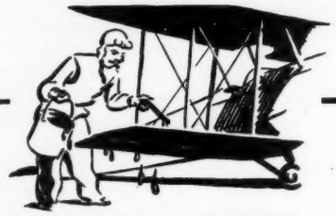
If you do not know us, ask your bank about us

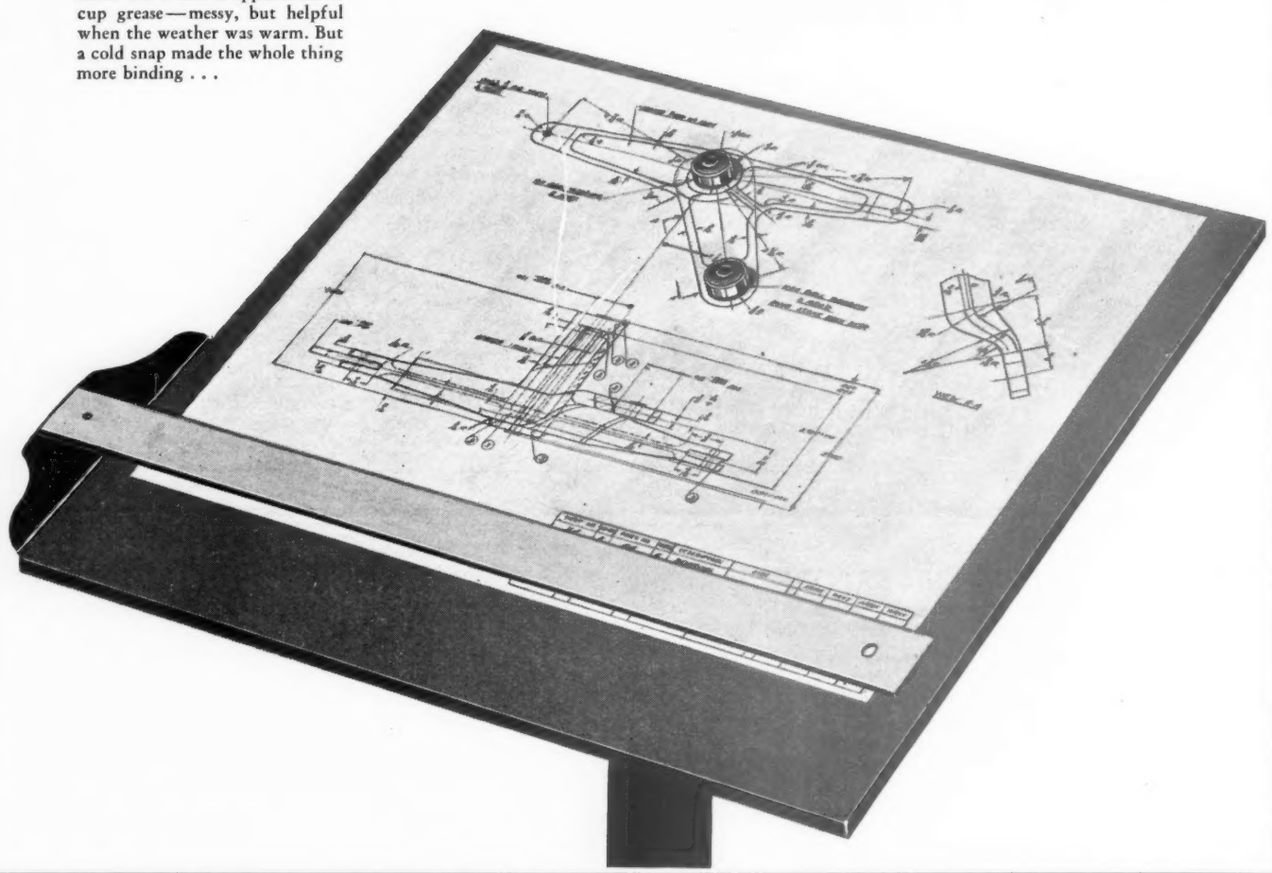


IT USED TO BE A QUESTION OF CUP GREASE . . . . .

Not very long ago, arthritis was *built into* aileron controls—and it was up to the brave ay-vee-ators to try to get it out! The treatment was a liberal application of cup grease—messy, but helpful when the weather was warm. But a cold snap made the whole thing more binding . . .

Today "AILERON ARTHRITIS"

Is Cured In The Blue Print Stage!



These are the days of brains over brawn in aircraft operation — and *design!* The blue-print above, straight from the engineering department of one of America's leading manufacturers, shows how Fafnir pioneering and development in aircraft ball bearings is reaping a harvest of careful bearing specifications—lettered on the blue-prints as they're drawn!

The engineers who laid out this aileron bell crank know that effortless, friction-free motion — without play — must be built into it at two points. Two Fafnir K4 ball bearings support the bell crank on its shaft. A third Fafnir — KS4 — joins the aileron push-pull rod to the bell crank; a self-aligning bearing, because the axis of the bell crank and the hinge line of the aileron are not parallel.

Take advantage of Fafnir development in aircraft ball bearing design; in seals and shields and proper lubricants, to engineer friction out of control systems, engines and engine accessories *while they're in the blue-print stage!* "Fafnir" lettered on your blue-prints, assures you the benefits of the foremost aircraft line, and the cooperation of Fafnir's aviation sales and engineering department . . . *"the aircraft specialists."* The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR *Ball Bearings*

THE BALANCED LINE • MOST COMPLETE IN AMERICA

AIR TRANSPORT AVIATION

by DAN SAYRE

» WITH unfilled business at a new high, Ryan Aeronautical Company recently issued rights to stockholders of record as of January 27, entitling them to subscribe to new $1 par value common stock at $3.50 per share in the ratio of one new share for each four held. The current issue will cover 75,000 additional shares, bringing the total outstanding to 375,000 shares of the 500,000 authorized. Proceeds from sale of stock, approximately $262,500, will be used for plant expansion, equipment and materials.

» BELL AIRCRAFT CORP., for 1938, net income of $65,488, equal to 33 cents each on 199,289 capital shares. Compares with $43,240 or 26 cents a share in 1937. Net sales $1,219,253, against $1,707,627.

» BREWSTER AERONAUTICAL CORP. declared a dividend of 10 cents a share on the capital stock, payable Feb. 15th.

» CESSNA AIRCRAFT CO., for 11 months ending Nov. 30, 1938, net profit of $1,539. For year ending Dec. 31, 1938, net profit of $1,022, against net profit of $326 for 1937.

» DE HAVILLAND AIRCRAFT CO. LTD., for year ending Sept. 30, 1938, net profits of £152,813, compared with £122,184 in preceding year.

» IRVING AIR CHUTE CO., and Subsidiaries, for year ending Dec. 31, 1938, net profit of $398,321, equal to $2.02 each on 197,500 capital shares; against $278,643 or $1.41 a share for preceding year.

» NATIONAL AVIATION CORP., as of Dec. 31, 1938, liquidating value was $17.46 a share on 477,274 shares of capital stock, against $12.70 a share on Dec. 31, 1937.

» PIPER AIRCRAFT CORP., for period from Nov. 14, 1937, to Sept. 30, 1938, net income of $14,031. Current assets as of Sept. 30, 1938, $245,074, liabilities, $126,598. Company sold 17,000 shares of convertible preferred stock, and 6,325 shares of common stock, receiving as proceeds, $161,500.

» ROOSEVELT FIELD, INC., for year ending Dec. 31, 1938, net income of $167, against net income of $979 for 1937. Capital stock consists of 298,700 shares of $5 par, excluding 61,300 shares held in treasury.

» SOLAR AIRCRAFT CO., paid a dividend of 5 cents a share on its $1 par common capital stock on Jan. 10, 1939.

» TAYLOR-YOUNG AIRPLANE CO., for year ending Dec. 31, 1938, net profit of $847 against a net loss of $22,619 for 1937. Equals seven-tenths of a cent per share on 113,344 shares outstanding.

Nine new routes planned by Braniff Airways. Applications have been made for 5,597 miles of new routes, all located in the central and central west area. Added to Braniff's present 2,711 miles the new routes would give a total route mileage of 8,308. It would then have the greatest route mileage of any airline in the United States.

40 per cent passenger increase for Chicago & Southern during 1938. Each succeeding month during 1938 including December showed a substantial traffic increase over the previous month. In expectation of a better year than ever in 1939, C&S is now negotiating for new equipment having a 60 per cent greater passenger capacity. A third round trip between Chicago and New Orleans has been authorized to start April 1.

Beginning February 15, Chicago & Southern has been making daily connections at Memphis with Eastern Air Lines to Florida and the southeast.

William C. Burks has been made District Sales Manager for Chicago & Southern at Memphis. He replaces Charles W. Metcalf who has resigned, effective March 1.

Citing a loss of $267,465 between July 3, 1934, and September 30, 1938 in operating between Minneapolis and Tulsa, Thomas Furtune Ryan 3rd, executive vice-president of Mid-Continent, has asked the CAA to increase the line's rate of airmail pay from 33⅓ cents to 40 cents per airplane mile, using a base of 67,000 miles. With this rate and a load factor of 34 per cent he said Mid-Continent would earn $7,587 in 1939.

Mrs. Lorna Livermore, wife of Joe Livermore, Northwest pilot who was killed December 18, 1936, was awarded a judgment of $37,500 by a Superior Court jury. The jury returned its verdict after being out forty-three hours. Court attachés predicted the possibility of a United States Supreme Court test case developing. The case is believed to be the first in the nation in which an airline was charged with negligence in the death of one of its pilots.

Railway Express Agency reports that shipments for the month were 83,956 pounds, a 29 per cent increase over December 1937.

William A. Rogers has been appointed

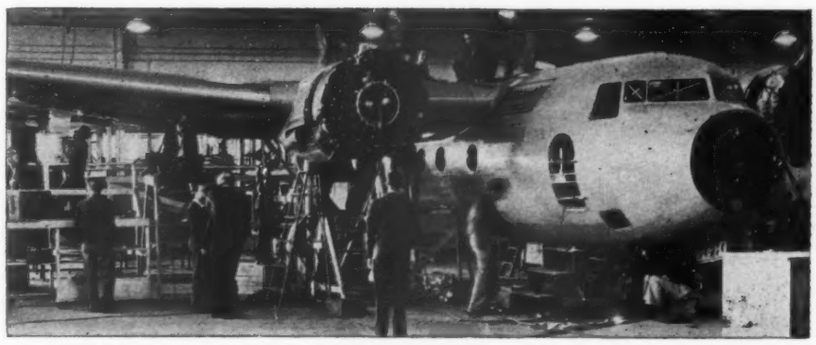
AIR TRANSPORT INDICATOR

February 1, 1939

127.09

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during January, 1939, to the corresponding figure for January, 1938.

The year got off to a good start with a total for January of 34,457,270 passenger-miles as compared with 27,150,000 for January, 1938.



DC-5 takes shape: In the El Segundo factory of the Douglas company, their latest transport is being assembled.

consultant of the Air Express Division of Railway Express Agency. For the past four years he has served in the Commercial Division of the agency in New York as a specialist in air express sales. Mr. Rogers was in the United States Naval Air Service during the war and served as pilot in the English Channel Patrol. On his return he continued as commander of a fighting squadron of the United States Naval Aviation Reserve.

Five new directors for TWA. The announcement was made by T. B. Wilson, chairman of the board. They stand high in national business circles and represent the East, Middle-West, and West, and are J. A. Ritchie, New York City; Sidney Maestre, St. Louis; R. C. Kramer and John Hertz, Sr., New York City; and Leland Hayward, Hollywood, Cal. Roland Palmedo has resigned from the TWA Board because of pressure of other duties.

About four and a half million dollars are to be spent on air passenger station construction projects along the TWA airway. The $175,000 administration building at San Francisco airport is now ready to handle the many travelers who will fly to the Golden Gate Exposition. New York's new North Beach Municipal Airport, adjacent to the World's Fair Grounds, will boast an administration building to cost $1,674,495.

Under a new ruling of the Associated Aviation Underwriters, aviation trip insurance may now be sold to all passengers regardless of age, eliminating the previous age limitation of fifteen to seventy. Associated Aviation Underwriters also announce that two new and simplified aircraft policies covering hull and liability have been especially prepared to meet the requirements of today's aviation market. The new policies are written clearly and concisely for the benefit of the layman, antedated restrictions have been eliminated.

MILITARY AVIATION

The Distinguished Flying Cross has been presented to Maj. Caleb V. Haynes by Major General Frank M. Andrews, commander of the GHQ Air Force, in recognition of his flight with a crew of eleven men in a B-15 to Chile's earthquake zone with medical supplies weighing 3,250 pounds from the Red Cross. The bomber left Langley Field, Virginia, on February 4 and landed at Santiago, Chile, at 7:51 A.M. February 6.

Total elapsed time—49 hrs. 18 min.
Total flying time—29 hrs. 53 min.
Total distance—4,933 miles
Average speed—165 miles per hour.

An Army pursuit plane was wrecked last month after almost breaking Howard Hughes' transcontinental record. The ship, flown by Lieut. Ben S. Kelsey, was a Lockheed XP-38 powered by two Allison engines. In elapsed time Lieut. Kelsey was 17 minutes 11 seconds behind Hughes. However, his flying time of 7 hr. 36 sec. was said to be the fastest ever made on a transcontinental dash. Fortunately, Kelsey was only slightly injured in the crash.

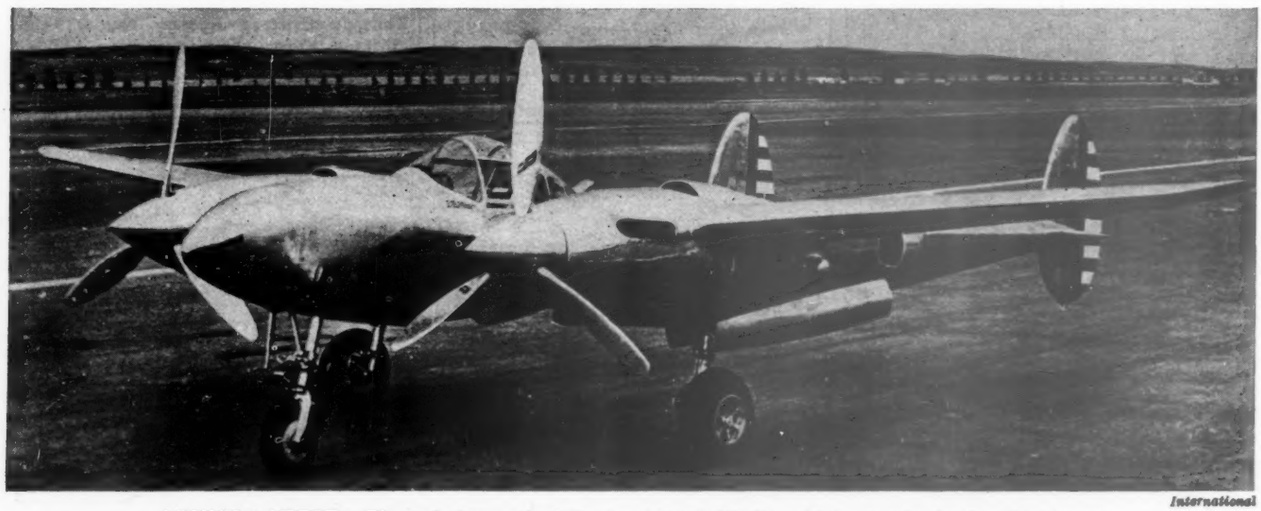
The ship was an Army secret and for that reason the results of the investigation into the cause of the accident will not be made public. Nevertheless, from eye-witnesses it was possible to learn that Kelsey's approach to Mitchell Field for landing was somewhat short. He apparently opened the throttles to get in to the field, but the left engine stopped; it appeared as though the right engine turned the ship so sharply to the left that Kelsey was forced to close the throttle in order to maintain control, the landing gear struck a tree and the plane crashed in a sand pit.

Curtiss-Aeroplane was low bidder on a recent Air Corps request for bids on Army pursuit ships. Air Corps Engineers at Wright Field, Dayton, Ohio, received bids from three manufacturers. On the maximum proposal asked, 2,000 planes, Curtiss Aeroplane bid $20,980 each; Bell Aircraft, $22,275; and Seversky Aircraft, $26,000.

Prospective bidders on the construction of a $3,000,000 Navy airship have asked for postponement until March 2 of the opening of bids.

Eight Navy planes were destroyed on a routine training flight of twelve ships on February 20. Two pilots, Lieuts. G. F. Presser Sr., a Brazilian Navy officer receiving regular training at Pensacola, and N. M. Ostergren, were killed and six others were saved by parachute jumps. The flight consisted of twelve airplanes, nine single seat ships with advanced student flyers in three formations and three two-place ships, each with an instructor and a student as passenger. An instructor's plane flew near each formation. Not long after their take-off from Pensacola a dense fog rolled in from the Gulf of Mexico. The three instructors received radio orders to fly north out of the fog; the students' machines were not equipped with radio and only one of them was able to follow the instructors through to safety. Six of the others jumped safely when their gas gave out, and two crashed with their ships and were killed.

An inquiry was started immediately headed by Lieutenant Commander A. J. Isbell. Secretary of the Navy, Swanson, also ordered an investigation.



International

ARMY'S LATEST: First photograph of the Lockheed XP-38 which nearly broke the transcontinental speed record, then crashed at Mitchell Field. Pilot was Lieut. Ben Kelsey.

In 1939 the FAIRCHILD "24" more than ever before is the logical choice of the private owner

During 1938, private owners and operators bought more Fairchild "24's" than any other 4 or 5 place cabin ships—in itself a significant indication of exceptional performance and value.

The first edition of a new booklet, giving all the details of the 1939 models, as well as other interesting stories of experiences by "24" owners will be gladly sent upon request. Demonstrations will be arranged at your convenience.

Definitely . . . a much finer airplane at no increase in price. Hydraulic brakes are standard equipment—instantly responsive to pedal pressure and requiring only 1/3 as much effort as mechanical brakes. A steerable tail wheel makes taxiing even in cross-winds as easy as steering a bicycle, but is automatically full-swiveling for spot turns and hangar-handling. Seats are scientifically contoured for comfort; upholstery is specially woven to Fairchild specifications; Plexiglas or Safety Glass door windows are optional; hardware is designed to harmonize with cabin appointments. Scores of other details have been added or refined to combine themselves into the biggest cabin plane value in America.

The Ranger engine mount has been re-engineered—is now, without exception, the smoothest engine installation on the market—a revelation to anyone who has never experienced the utterly relaxed pleasure of riding behind a Ranger.

FAIRCHILD

AIRCRAFT CORPORATION

Hagerstown *Maryland*

Honors Night

Lester Gardner Scores Again with Brilliant Annual Aeronautical Dinner

AT LEAST 99 PER CENT of Who's Who in Aviation in America foregathered in the grand ballroom of New York's Biltmore Hotel on the evening of Jan. 27 to attend the grand finale of the three-day annual meeting of the Institute of the Aeronautical Sciences, the Honors Night Dinner. Between them, T. P. Wright, retiring president, and Dr. George W. Lewis, his successor, ably handled the performance. High spots were the presentation of the Sylvanus Albert Reed Award for 1938 to Professor A. V. deForest of M.I.T. and the Lawrence Sperry Award to Russell C. Newhouse of the Bell Telephone Laboratories. Honorary membership in the Institute went to Maj. Gen. H. H. Arnold, Edward J. Noble, Dr. Lyman J. Briggs, Rear Admiral Arthur B. Cook, and Lieut. Commander F. W. Reichelderfer.

Ten newly elected Fellows of the Institute were presented, including Henry A. Berliner, W. G. Brombacher, C. F. Draper, Lester D. Gardner, R. D. MacCart, W. Bailey Oswald, Elliott D. Reid, Elmer A. Sperry, Jr., Edward F. Taylor and John E. Younger.

Honorary fellowships went to George J. Mead and D. R. Pye.

Foy Joins Directorate

DONALD L. BROWN, president of United Aircraft Corporation, announced the election of Byron C. Foy, vice president of the Chrysler Corporation and president of the De Soto Motor Corporation, to the Board of Directors of United Aircraft. Other members of the board are Frederick B. Rentschler, chairman; Donald L. Brown, Eugene E. Wilson, George J. Mead, Joseph F. McCarthy, Raycroft Walsh, Rensselaer W. Clark, J. Carlton Ward, Jr., Peter M. Fraser, William B. Mayo, Edward O. McDonnell, and Harry C. Stoddard.

Named Ass't. to President

F. B. HUFNAGEL, chairman of the Crucible Steel Co. announces that R. E. Christie, who has long been identified with the company and the specialty steel business, and who has many friends in aviation, has become assistant to the president, R. E. Desvernine.

M.A.A. Elections

MANUFACTURERS AIRCRAFT ASSOCIATION, which administers the closs-licensing patent agreement for the airplane manufacturing industry in America, has re-elected Samuel S. Bradley as chairman of the board; Frank H. Russell, president; and John A. Sanborn, general manager. Joseph T. Hartson is secretary and James P. Murray treasurer. Vice presidents are E. E. Wilson, E. N. Gott, W. E. Valk, J. M. Rogers. The above officers were also elected to the new board of directors as were W. H. Beal, C. J. Brukner, L. R. Grumman, and J. H. Kindelberger.

AVIATION ABROAD

Four new Imperial Airways flying boats have been earmarked for the North Atlantic. They are the "Cabot", "Caribou", "Connemara", and "Clyde". These will be the first ocean air fleet equipped to take advantage of regular aerial fueling. In addition they incorporate a number of innovations suggested by the 1937 surveys. Among these is a transparent, retractable navigating dome, which can be raised above the fuselage, as required, to facilitate celestial observations. About eighty passengers are said to have already booked passage on Imperial's first Atlantic flight, even though Imperial has set no date for the start of passenger operations. In fact, they have said that they may not carry passengers at all this coming summer.

5,515 passengers were carried to and from Bermuda during 1938, according to figures released in Bermuda by Imperial and Pan American. The year's most popular flight month was August when 582 were carried.

The England-Cape Town record has been cut by 31 hours. Although ill with malaria and bleeding from a cut on the forehead, Alex Henshaw landed on February 9 at Gravesend after breaking all records for the flight from England to Cape Town, from Cape Town to England, and for the round trip. He was so exhausted after his 13,000 mile solo flight that he had to be lifted from his plane. His total elapsed time was four days, ten hours, and sixteen minutes. Henshaw flew the same Percival Mew Gull in which he won the King's Cup last year.

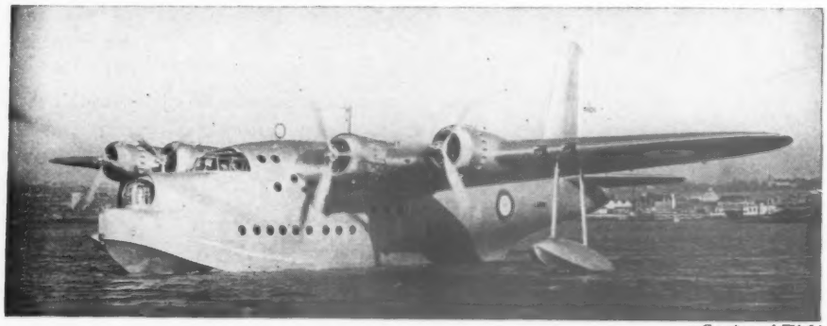
Air France carried its 100,000th passenger of the year on December 18th. It was Mrs. J. E. Richardson of London. She was invited to return to Paris on January 24th for an "air party" given in her honor. Among the notables present were M. Lucian Bussoutrot, who in 1918 was the first pilot to cross the Channel with a French passenger plane, and M. Chevillard, the first passenger to cross in a French plane.

"Frobisher" air liners returned to London-Paris service January 22. These new ships had been in operation only two days when they were withdrawn from service following an accident in which the landing gear collapsed at Croyden shaking up twenty one passengers. Imperial Airways said, on returning the ships to service, that the accident was due to the "unusual state of the airdrome surface, not to a mechanical defect."

Two Netherlands military missions are here to buy airplanes. One Navy and one Colonial Army mission arrived in Washington the latter part of February. The Army was said to be interested in the purchase of 100 airplanes from Glenn Martin, and an undisclosed number of Lockheeds. Army and Navy permission has been received for the missions to visit the plants.

KLM opened a new route on February 10 between Trinidad and Barbados thus connecting the latter with Curacao. Lockheeds will be used in a tri-weekly service over the route.

The 10th anniversary of the Swedish night air mail service, said to be the first of its kind in Europe, has been observed. It was organized in 1928 by the Swedish Post Office Department and the Swedish Aerotransport Company. It is also 25 years since the first night flight in Sweden. That was accomplished on the evening of March 11, 1914, by Dr. Enoch Thulin in a flight of 58 minutes.



Courtesy of Flight

AIR BATTLESHIP: Short Sunderland (4 Bristol Pegasus XXIIs) for the Royal Air Force.

AVIATION'S OPERATORS CORNER

Tagging the Bases with

LES NEVILLE

Everyone is talking about flight training these days and the experimental federal program is getting under way in the colleges selected for it by the C.A.A. M.I.T. will take off on its pilot training program in the near future and details have just been announced by Dr. Carl Compton. One of the 13 guinea pig colleges, Technology will select 70 of its students now enrolled and the C.A.A. will choose the 20 of these who are to receive the training. Ground school work will be given at the college and flight instruction under C.A.A. supervision by a local fixed base operator. The program will be in the competent hands of a committee of three faculty members,—Prof. Richard H. Smith, chairman; and Professors Charles S. Draper and Otto C. Koppen. Ground courses will include civil air regulations, navigation, and meteorology. Flight work consists of 8 hours dual and 27 hours of dual observation and solo flying during which the student will fly one solo hour for each half hour of dual. Participation is restricted to sophomores, juniors, seniors, and graduate students whose scholastic records indicate their ability to add this work to their present courses. Successful passing of the C.A.A. physical examination and parental permission are among requirements. Expense to students is a nominal sum for personal insurance. In the New York Area the training program is under the direction of the Guggenheim School at N.Y. U. and bids for student training for the remainder of 1939 have been asked of certified instructors at any qualified airport a 20-mile radius of N.Y.U. As we go to press no official release has been made regarding the fixed base operators who have won the contracts for flight training, and rumour has it that at least one is already at work. Why the secrecy?

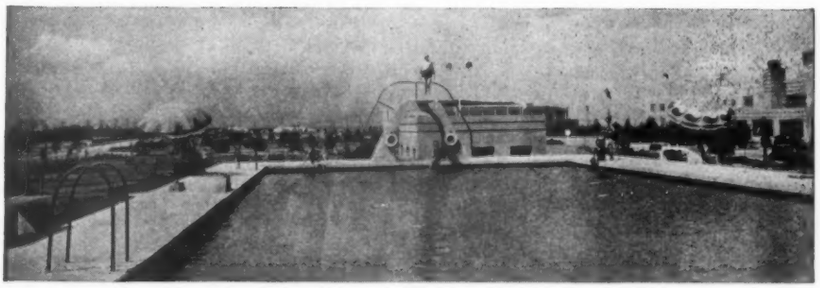
Oliver Parks has stepped out and now he heads up another school which was incorporated last month under the name Alabama Institute of Aeronautics at the Tuscaloosa Municipal Airport. A lease assures exclusive non-scheduled operations rights for eight years with a 12-year renewal option. Parks took over at the joint invitation of the Commission Board of Tuscaloosa and the faculty and officials of the University of Alabama, second of the 13 colleges selected for the C.A.A. training program. Vice President Walter P. Thorpe of A.I. of A. is superintendent of operations. Two Dart Trainers, a Kinner Sportster, and a Stinson Junior are used.

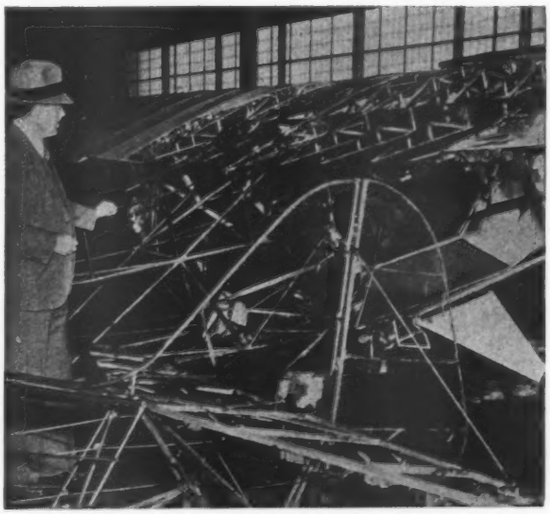
O. L. PARKS heads Alabama Institute

N.A.A. wants to teach them younger than 18 and devoted a large part of its annual convention to discussion of a plan to encourage instruction of school children of tender ages in model making, gliding, as a regular part of their public school work. N.A.A. chapters in 150 cities will work with their local boards of education and in other communities will work through established organizations. By this method some 17 to 20 million school children will be taught primary aviation annually.

Birmingham is on the job early as usual with announcement of the dates of the 9th Annual National Air Carnival June 3 and 4. They put on an exceptional show last year and we can count on an even better one in 1939.

Free flying in Tennessee ended its first year with a brilliant record of accomplishment and State Director Walter Williams is to be congratulated for





3 OUT OF 32: Manager E. E. Elam of Shushan surveys the three ships burned in a recent fire in Moffett Hangar. Mr. Elam credits the saving of all but $1,700 worth of the $450,000 valuation of airplanes in the hangar to the quick action of the Rockwood Sprinkler System supplied by the attractive swimming pool shown above.

DIRECTOR AND CHAMPIONS: Left to right: Pauline Niscon, State Champion (Memphis); Lorain Butrey (Nashville); Major Walter Williams; Louise Carson (Knoxville); Ruth Bellew (Johnson City).

his excellent work. Of the 2500 persons enrolled in the ground schools, fifteen students from each of the five schools at Memphis, Chattanooga, Johnson City, Knoxville, and Nashville, were selected for flight training and 71 of the 75 selected now hold Private Pilots Certificates. The record shows no accidents in 3516 hours of flying and a cost of 23½ cents per hour for maintenance which has kept the ships practically as good as new.

One man and one woman from each school was selected champion and met at an air meet in Nashville to determine which team was to hold the state championship. Memphis carried off the honors with its champions, Miss Pauline Niscon and W. O. Caldwell. Classes for 1939 are already under way with a large enrollment and a still larger number of students will receive the advantages of flight training.

Attempts to close Southwest Airport have continued and during early February the city attorney of Los Angeles opened his effort in the court of Superior Judge Roy V. Rhodes. Bertrand Rhine, well known private pilot, acted as defense counsel for the airport. As we go to press the legal phrases are still flying thick and fast and no decision has been rendered in this very important case. The prosecution has produced many witnesses who obviously do not like to live near the airport and who have testified with relish to alleged noise, dust, low flying, oil dropping from planes, etc. The defense, on the other hand, has shown that field oiling will eliminate the dust, and that the noise, as actually tested by a decibel meter, is less than that of such common home noises as the vacuum cleaner, door bell, telephone, radio, and electric kitchen mixer. Assurance of tenure by private airport operators throughout the country will be directly affected by the court's decision, which should be available when next we go to press.

Massachusetts wants an Aviation Commission and a bill has been filed in the legislature to provide for its creation. The commission which would supersede all existing state bodies that supervise aeronautical activities and facilities, yet would use or take advantage of the facilities of all existing departments which might aid in promoting aviation. Crocker Snow, Dr. Karl T. Compton of Massachusetts Institute of Technology, Robert M. Love, president Inter City Airlines, Major Arthur L. Richmond, Air Corps Reserve and Godfrey L. Cabot, pioneer in the aviation field, are the petitioners for this legislation.

THE REPORT CARD

Of Air School Developments

Ground courses for Canadians have been started again this year by the Montreal Light Aeroplane Club. Twenty lectures, open also to non-members, will be given in the engineering building of McGill University. H. Wisenthall will be in charge of the ground school.

Painters who want to spray can learn how at the classes conducted by the De Vilbiss Company in Toledo, which start March 13, April 17, May 15, and June 5. Special rates in local hotels and boarding houses are available to students.

Eighty-nine graduates of the Manhattan High School of Aviation trades listened to commencement addresses by Major J. A. McDonnell, chairman of the Aeronautic Educational Commission; Col. Charles W. Kerwood and Major Frank J. McSherry.

A class of 10 have started the eight-week course in Air Traffic work given by E. K. Smith at his New York office. Classes are held in the evening and include studies in routing passengers, lectures by air line officials, visits to airports and airline offices, and sales, promotional, and advertising training. Practical experience in dealing with the public is also available to students.

1000 hp. engines can be tested on the new torque stand recently installed in the Power Plants Department of the Boeing School at Oakland, California. Other equipment additions include a new hydraulic universal testing machine for the materials testing laboratory and a photo-elastic machine in the science lab. A training room for radio operators has been built recently in the radio shop. From there students have an opportunity to acquire experience in the U.A.L. radio room at the Oakland Terminal.

BROADCASTER: Capt. Hilding N. Carlson, who teaches aviation by short wave radio.

NEW DIRECTOR: Lieut. Commdr. G. O. Noville (right) is now director of training for California flyers. Executive Vice President N. E. Sherman (left).

Tell-Tale

(*Continued from page 55*)

conditions. The first part will be referred to as the "engine panel," having two divisions, each serving one engine and its immediate accessories. The second part is the "control panel" dealing mainly with control settings.

Each division of the "engine panel" consists of a plate with transparent lettering and with a disk at each end which indicates whether the particular condition is below the lower limit or above the upper limit of desired operation. When starting a particular engine, the master switch is turned to the "on" position and the panel subdivision governing that engine will at once be illuminated with lights to indicate that certain instruments are below the operating limits. As the engine is started and warmed-up, the lights will go out as the various units begin to function within their prescribed range. When the panel sub-division is completely dark, the engine and accessories are ready for flight and the pilot is assured thenceforth that they are all functioning properly so long as the panel sub-division remains unilluminated.

The "control panel," consisting of several plates with transparent lettering, with disks at each end, will indicate whether the control designated is "off" or "on," "open" or "closed," "locked" or "unlocked," "up" or "down," as the case may be. Illumination of these panels is controlled by a selector switch of an interlocking push button type. As shown in the photographs, buttons are labelled "start," "taxi," "take-off," "left-engine," "right-engine," "cruise," "land," and "stop." Each push button connects circuits to all controls which relate to the desired operation. In addition, a "test" button for simultaneously lighting up all lights to check bulbs and contacts is incorporated.

Typical operation of the "Tell-Tale" system is as follows: When starting the engine, the "start" button on the control panel will be pushed in; this will immediately warn the pilot of such things as open doors which might be affected by the slipstream; of unlocked parking brakes; of improper mixture control; and of numerous other items which might be overlooked. After controls are properly set so that all lights on the panel have progressively gone out, the pilot is ready to start the engines. Throwing on the ignition switch of an engine will cause the "engine panel" sub-division involved to be illuminated and as the various instruments register the proper operating range of pressure, temperature, etc., as described above, corresponding lights will go out. When the entire sub-division of this panel is dark, the plane is ready to taxi.

But, in order to start taxiing, it is necessary to release the parking brake which will immediately light up a miniature sign which reads "parking brake off." In order to darken this sign, it will be necessary to push the "taxi" button, closing this circuit, which will immediately show by means of illuminated signs whether or not the tail wheel is unlocked; safety belt fastening signal has been flashed to passengers; and other like essentials for taxiing. Then, when at the end of the runway, the "take-off" button will be pressed and will immediately show whether control locks have been overlooked; whether the control tabs are at the proper setting; whether the propeller is in low pitch; and the like.

When in the air, a similar procedure is followed to check "cruise" condition. In the emergency which might be caused by the failure of an engine, the single engine flight control is engaged whereupon the sub-division of the "engine panel" involved would immediately and automatically show the steps which must be taken to insure most efficient operation on the remaining engine.

Similarly, in landing, a check as to proper position of mixture control, flap position, aileron and rudder tabs, and de-icer position can instantly be obtained.

This discussion could be expanded to cover all the many items which the system controls, but it is believed that the foregoing adequately shows the principle, necessity and arrangement of the system. It is obvious that as at present planned for the Curtiss-Wright Twenty Transport, this system is not intended to supplant any of the instruments required for a modern air transport but is essentially designed to relieve the pilot of the necessity of attempting to watch all of them at once. The system in a modified form has been tried out on a fighting plane so that service test experience has been gained.

Great credit is due to the engineers responsible for carrying through this development, Mr. Willis L. Wells and Mr. Raymond A. Rugge, working under the direction of Mr. George A. Page, Chief Engineer of the St. Louis Airplane Division of Curtiss-Wright.

Buyer's Log Book

(*Continued from page 67*)

Dardalet Engine Mount Bolts

Recent Application Found in the Structure of New Airplanes

MANY APPLICATIONS for Dardalet self locking bolts are found in present aircraft designs. Their use in engine mounts is particularly noteworthy. In assembly the threaded nuts spin on by hand and lock positively without the use of wires, pins, or washers. Additional strength of the bolt is due to the increased diameter through the minimum thread section as compared with the American National Thread form. Another advantage claimed for Dardalet is a 75 per cent higher impact or shock value. This is credited to the design which avoids the notch effect of the 60 deg. angle of the American National form and provides a broad flat on the root which insures greater distribution of stress throughout the length of bolt and nut thread engagement.—AVIATION, *March, 1939.*

Loadometer

Black and Decker applies highway scale to aircraft problem

SINCE all aircraft, regardless of type or size, must be weighed at least once in order to meet ATC requirements, the problem of suitable weighing means has been rather general throughout the aviation industry. Also, it has proved valuable to conduct frequent weighings of most transport planes in connection with normal operations, and servicing or maintenance. To meet this condition the Black & Decker Mfg. Co., of Towson, Maryland, has developed the Load-O-Meter. This scale is a direct reading lever and spring machine of compact size and light weight. Easily portable, the Load-O-Meter is also extremely accurate, being guaranteed to within 1% and usually working to 1/10th of 1% on heavy loads approaching the 20,000 lb. capacity of the scales. Net weight of the Load-O-Meter is 80 lbs. Width is 18 in., length 19 in. and height 17¼ in. Platform height is only 3½ in. and platform dimensions, 9 x 17½ in. Readings may be taken to within 10 lbs. and accurate readings may be taken with increasing or decreasing load increments. The machine is ruggedly constructed.—AVIATION, *March, 1939.*

T. E. BRANIFF, PRESIDENT of Braniff Airways, The Great Plains Route from the Great Lakes to the Gulf. Headquarters, Oklahoma City, Oklahoma.

ROBERT J. SMITH, VICE-PRESIDENT, Braniff Airways, in charge of operations. Headquarters, Dallas.

CHARLES E. BEARD, VICE-PRESIDENT, Braniff Airways, in charge of traffic. Headquarters, Oklahoma City.

Braniff hostesses in modified Mexican garb lend charm to your trip via Braniff Airways.

Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment —Every Wednesday Night—Columbia Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

NEW TEXACO